WORLD PETROLEUM

APRIL 1958

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table of contents page 3

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Before any Cameron casing hanger is ever offered for sale, a tremendous amount of pipe is used for research and experiment without a single foot of hole being drilled.

Because of Cameron's continuous design development program and today's deeper drilling demands, the over-all concept of casing suspension has changed. The Cameron "CA" Hanger has made possible automatic, foolproof setting for every condition. The "CA" holds everything from the very lightest to the very heaviest pipe loads at all pressure ranges anticipated today. It also:

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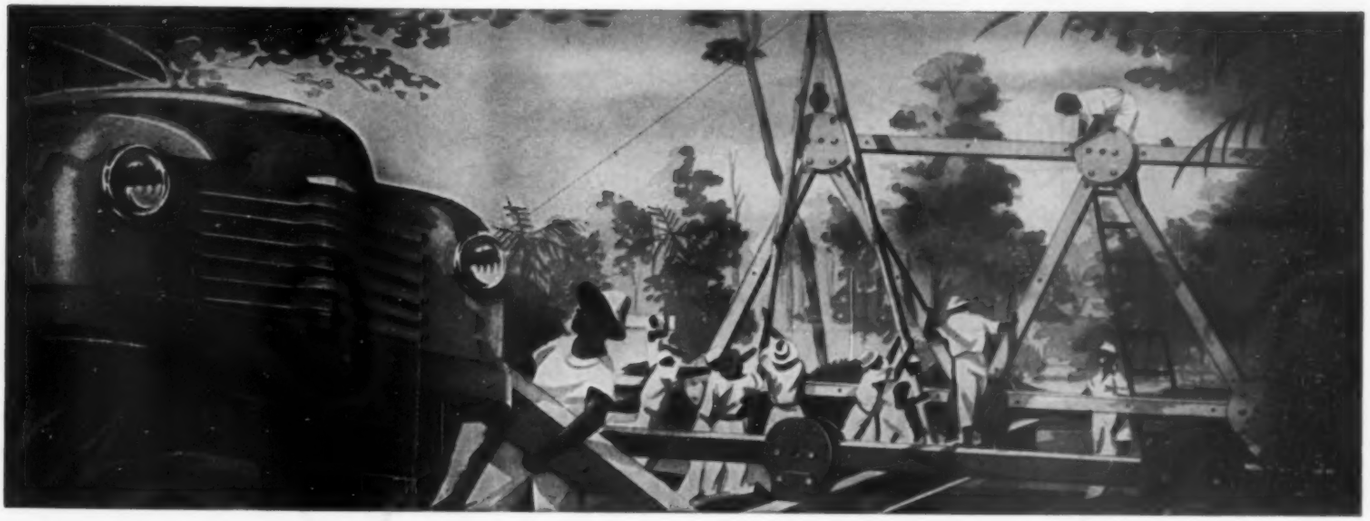

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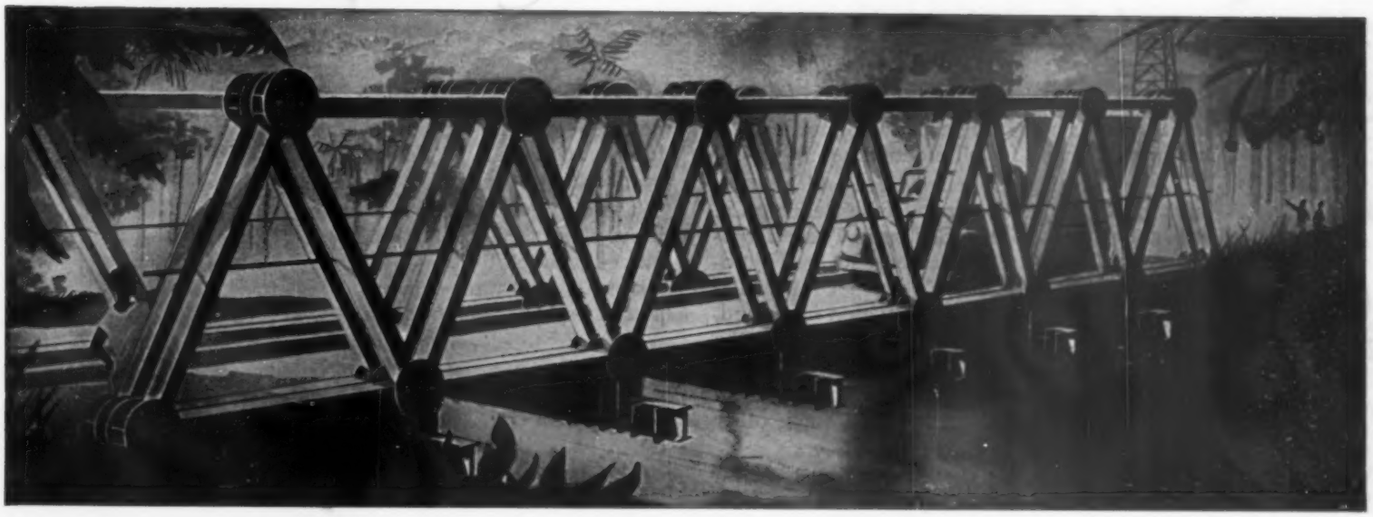

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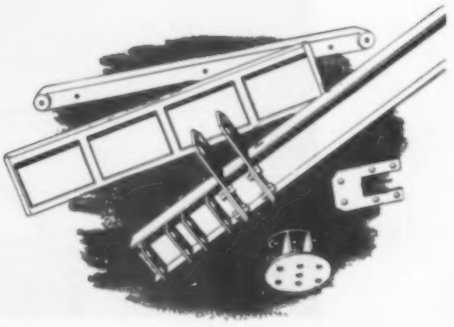

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LUMMUS BUILDING $30-MILLION REFINERY AT WHITEGATE, IRELAND

New 40,000 B/D Installation for Irish Refining Co., Ltd.

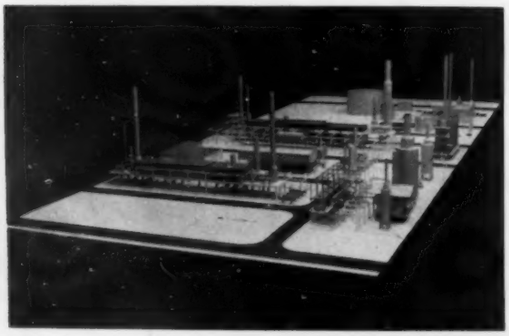
Latest of 19 built by Lummus throughout the world since end of World War II

In the Whitegate area of County Cork, Ireland, a new refinery is now being constructed to meet the increasing demand for oil products.

The refinery is being engineered and built by Lummus for the newly formed Irish Refining Co. Ltd., a joint enterprise of California Texas Corporation, Shell Mex & B.P. Limited and Esso Petroleum Company Limited. As much construction material as possible will be purchased in Ireland, and Irish nationals will be trained to operate the completed plant.

Crude oil distillation facilities will produce jet fuel, diesel oil, fuel oil, light naphtha and other products.

A Powerforming Unit will catalytically reform 9,000 B/D of naphtha to produce 100-octane Powerformate. The unit will include a special hydrofiner to eliminate sulfur compounds from the raw feed stock, and light end facilities. This Powerformer is the only high octane processing unit needed to meet the projected marketing demands.



Model used by Lummus Ltd. in engineering of Whitegate Refinery.

There will also be a gas oil hydrofiner to desulfurize about 6,000 B/D of crude gas oil, the desulfurized products to be used for autodiesel fuel and for blending to form industrial diesel fuel, turbo-jet fuel and tractor vaporizing oil.

Other features will include a copper chloride treating plant for raw gasoline to be blended with regular and premium gasolines, and naphtha to be blended into turbo-jet fuel, regular gasoline and tractor vaporizing oil; facilities for about 10,000 B/D of crude naphtha; and facilities for blending gasolines and adding anti-knock compound. Most of the plant will be air-cooled so that little or no cooling water will be required.

With the completion of this project in 1959, Lummus will be responsible for an impressive percentage of the new refining capacity constructed throughout the world over the past ten years. The experience gained in these projects, as well as in designing and constructing a wide variety of over 700 other plants in the last 50 years for the process industries, is at your disposal. If you have a project in mind, we will be glad to discuss it with you.

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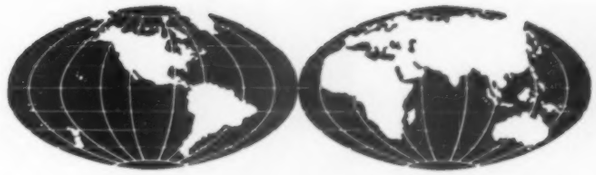

VOL. 29, NO. 4 APRIL, 1958

World Petroleum

THE MANAGEMENT PUBLICATION OF THE INTERNATIONAL PETROLEUM INDUSTRY

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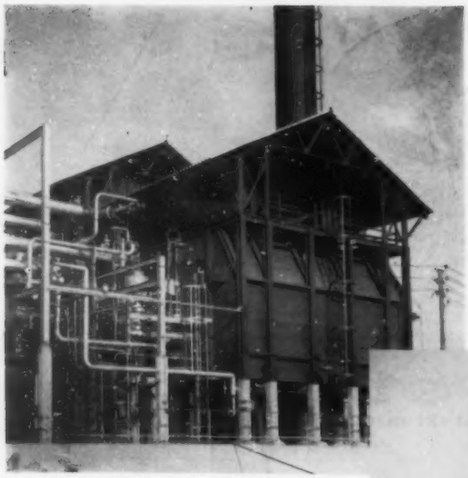
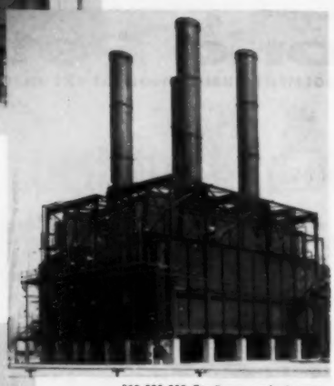
THIS MONTH'S COVER

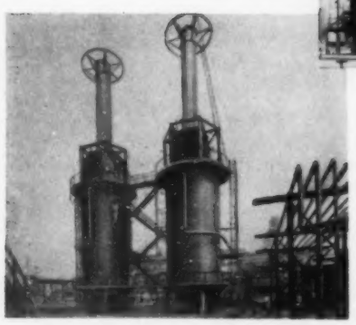
The *S.S. Gulfking* during a speed test run. An article describing Gulf Oil Corporation's new tankers of which the Gulfking was the first, appears on page 58 of this issue. Color photographs are reproduced through the courtesy of Donald C. White, editor of *The Orange Disc*, Gulf's house magazine.



Petrochemical pyrolysis heater, France



300,000,000 Btu/hour crude heater for 100,000 B/D crude unit, U.S.A.



Lummus vertical tube heater, United Kingdom

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Whether for petroleum refineries, chemical or petrochemical plants, Lummus will design, engineer and construct your next heater installation—regardless of size or type—for any major process, around the world.

Lummus heater services are made available on three bases: 1. engineering only; 2. with all material delivered to job site; and 3. completely erected.

Lummus horizontal tube or vertical tube oil heaters, of both special and standard design, range from 100,000 to 300,000,000 Btu per hour. In the last 25 years, the combined capacity of Lummus oil heaters purchased has exceeded that of any other company in the world.

As illustrated above, neither size nor location of the unit presents a problem to Lummus. These units are designed and engineered by the Lummus New York staff, who put the full benefit of their accumulated years of experience into each job. Procurement is made through the nearest of the five Lummus international group of companies and the cost of the job is payable in the currency of the country in which the procurement is handled!

Consult with Lummus on your next oil heater.

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CHICAGO, WASHINGTON, D.C., HOUSTON, BATON ROUGE, MONTREAL, CARACAS, LONDON, PARIS, THE HAGUE

By Joseph B. Huttlinger

The cabinet committee on crude imports is moving toward a tougher program to limit crude imports to the USA. The committee, of which Secretary of Commerce Sinclair F. Weeks, is chairman, met several times in March to consider these, and other problems: (1) What to do about 24 "new" oil importers who asked to bring in a total of 225,000 b/d to the gulf and east coasts. (2) Whether the present "voluntary" program is working and, if not, whether to take mandatory action, and what kind of action. (3) What kind of program to put into effect starting July 1, when the present rules and regulations expire.

For the first six months of this year, the program allows 991,500 b/d of crude imports. Some 18 companies importing to the West Coast were given quotas which add to 220,100 b/d. Gulf and East Coast quotas added up to 771,400 b/d.

The cabinet committee met at a crucial time. The "voluntary" program began to show signs of strain, if not collapse. Falling demand brought the heaviest slash in Texas allowable production for March since before World War II. And more than a score of new importers are seeking to import crude oil. USA refiners claim they save 50 cents to $1 a barrel by using imported oil.

Finally, the handling of the oil-import problem is likely to spell defeat or success for President Eisenhower's proposals to extend the reciprocal trade agreements act for another five years, without crippling amendments.

Unless the administration acts to hold the line on crude imports, Congress will act by amendment to the trade bill. If Congress acts to curb oil imports, chances are it will act to curb imports of other commodities. Thus, the trade bill might look like the old Smoot-Hawley tariff bill in the end. Therefore, the cabinet committee is thinking along these lines: (1) The total of allowed crude imports must be observed; perhaps, the total should be lowered east of California. (2) Product imports may have to come under import controls. (3) Military purchases of jet fuel, which have been shifted to the Caribbean by "lowest bidder" rules, must be shifted back to USA refiners. (4) Some of the 24 "new" importers deserve import quotas. Favored treatment should be given to refiners on coasts, and companies with production abroad. Companies wishing a quota for a coastal refinery to be built in the future, companies with inland refineries, and brokers should receive little or no quota. Coastal refiners, too, should get only an amount of foreign crude based on percentage of foreign crude used in competing refineries. (5) Quotas given "new" importers should be taken away from

PIPE LINE

quotas allowed to established importers in a "move over" policy. (6) Finally, teeth must be added to the "voluntary" program so that one company cannot bring in twice the assigned quota, as one company did. Mandatory quotas, higher tariffs, or other crackdown is needed.

Once regarded as "temporary," the voluntary import program now is seen as likely to be here for years. Captain M. V. Carson, Jr., told officials of one company to "look to the world markets, not the United States," years off when and if it brings in more production. "I don't foresee much increase in demand here," he said.

As many see it, the whole import program is flirting dangerously with widespread controls over prices, and with rationing and allocation controls. Captain Carson has warned that mandatory controls over imports is likely to lead to such controls in the end.

Flow of crude imports to the West Coast during January was below the levels permitted by the "voluntary" program to limit crude imports, according to Captain Carson.

Mohawk Petroleum Corp., San Francisco, with quota of 3,100 b/d, has decided not to use it for at least the next three months —perhaps not for six months.

Four more California companies, meanwhile, have asked to bring in 14,000 b/d. They are Harbor Refining Co., Long Beach; Rothschild Oil Co., Santa Fe Springs; Envoy Petroleum Corp., Los Angeles; and Sunset International Petroleum Corp., Beverly Hills.

Congressmen considering legislation to limit imports of crude and products are split as to whether to use the tariff route or the quota route. A tariff they see as clearcut, simple, and self-enforcing; in contrast, a quota system could lead to an "oil czar" to say who may and may not import crude. The tariff is seen as some protection to the price structure for oil in the USA, in contrast to the quota. Finally, the tariff tends to cut down the economic incentive to import oil, while a quota does not.

A main proposal being considered is S. 3363, introduced by Senator Ralph Yarborough (D., Texas) to hike the import tax for crude to 84 cents a barrel. Now it is 10.5 cents. Import tax on gasoline would go from 3 cents from 2 cents, and on lubes to 5 cents from 4 cents.

Representatives of a number of companies which are newcomers in the field of foreign production recently have reported on their activities and prospects for future production.

San Jacinto Petroleum Corp., New York, has a crude production outside USA of 7,700 b/d, and expects this will reach 17,600 b/d by year-end. John E. Kilgore, vice chairman, said the figure represents San Jacinto's interest of 4,100 b/d in Venezuela production and 3,600 b/d in Iran, where the company has an interest of 5/12 of one per cent.

"Through its wholly owned subsidiary, San Jacinto Venezolana CA, the company holds an interest in two concessions in Lake Maracaibo, one in the state of Apure, and three in the

(Continued on page 82)

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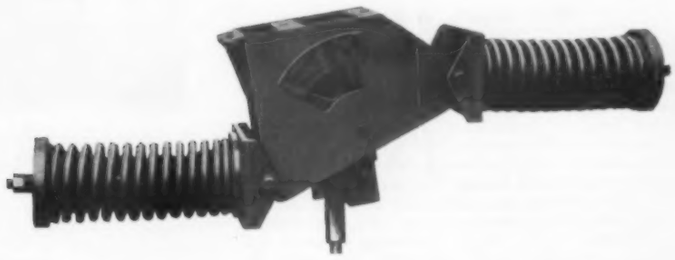
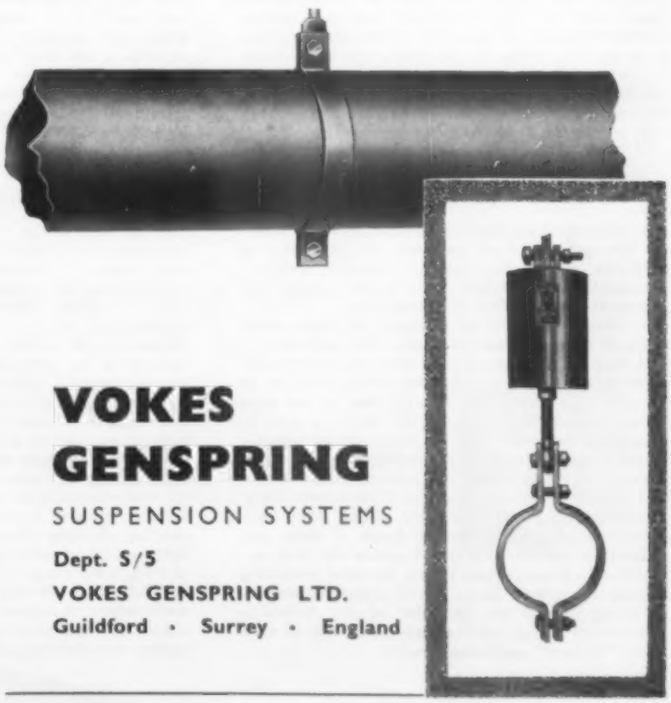


Piping that moves may well give rise to weight transfer and dangerous stresses at terminal points. Some high temperature pipes need complete support throughout their range of movement and to control vibration, while others need only limited control of vertical movement. In both instances the support provided must be correctly related to the stresses. Scientifically designed and constructed VOKES GENSPRING Suspension systems keep all such stresses safely under control. For uniform support VOKES GENSPRING CONSTANT SUPPORT HANGERS accurately balance the weight of the pipe, allow free non-resonant movement in all "hot" and "cold" positions, so eliminating weight-stress. Made to support loads of up to 30,000 pounds with travels up to 12", they simplify piping design and give the best possible protection to costly equipment. Designed to control vertical movement, VOKES GENSPRING VARIABLE SUPPORT HANGERS (shown below) give a variation of only 4½% of rated capacity per ¼" of deflection. They provide a safe and convenient method of support, they are easily installed and may be moved at will for use in alternative positions. Various types are available including special adaptations for low headroom. If you have pipe suspension troubles send for the two Vokes Genspring Catalogues. They give full details of each method and will help you to select the type of suspension most suitable for your particular requirements.



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London Letter

By A. L. Paget

Shell Assets in Egypt

Shell Co. officials from Britain and Holland are currently visiting Egypt to investigate the situation regarding the company's properties which have been under sequestration since November 1956. The main Shell asset is Anglo-Egyptian Oilfields, which is about 50% British-owned. The company's installations—five oil fields and Suez refinery—are probably worth at least £35 million. The marketing concern, Shell Co. of Egypt, is a subsidiary of Royal Dutch-Shell, with fixed assets of more than £5 million. According to Mr. Arafa, Custodian-General for British Property, about £E500,000 was spent on repairing damage to Anglo-Egyptian's Sinai installations. It was stated, late in 1957, that the sequestrator of the Shell Co. had paid £E1.2 million to the government as "final settlement" of a taxation claim arising from sale made several years ago by Shell to the Egyptian State-controlled Soc. Co-operative des Pétroles. Shell itself had previously contested this liability, and the issue had gone to arbitration.

Equipment for Venezuelan Oil Fields

First of their kind to be made in the United Kingdom, two trucks—each a mobile workshop with a radio cabin and aerial—were shipped recently to Cia. Shell de Venezuela for use by oil-field workers. Mounted on Commer 3-ton LWB chassis, the bodies —which cost about £1,250 each ($3,500)—were made to the design of Shell engineers by O. G. Lywood Ltd., Hayes, Middlesex. Strongly constructed of steel to withstand rough conditions in the oil fields, they will be used by skilled men, in radio communication with their base camp, for emergency repairs by day or night to oil wells and oil-field installations.

Each truck is divided into two compartments. The forward compartment houses the crew and radio operator; the rear compartment carries a switchbox and a large toolbox; facilities are provided for carrying long lengths of pipe, for manipulating which there is a 6-in. engineer's vise on a sliding drawout support. A light-alloy aerial mast is fixed to an outside corner of the truck; two searchlights are mounted on the catwalk at the rear of the truck. A transformer connected to the mains through the switchbox and a 30-meter length of cable provide power for hand tools and hand lamps.

Oil Prospects in Europe

A substantial increase in oil production in Western Europe, where oil prospects are described as distinctly encouraging, can be achieved "within a reasonable time," according to a new report just published by the OEEC Oil Committee.

In 1926, only 12.6% of Europe's oil needs were supplied from its own resources. But, says the report, this contribution can be very much improved —not only in absolute value, but as a percentage of the growing demand for energy. One of the most encouraging factors has been the rapid increase in production over the past 10 years—made possible by the discovery of large oil fields, each containing reserves of more than 14 million tons—in the Netherlands, Germany, Austria, France, and Sicily. In addition, "vast accumulations of gas" have been discovered recently in the Po Basin of Italy, and in Lacq in France. The report points out that exploration in those regions which are most promising geologically is only in its initial stages. Other encouraging factors are the size of the favorable sedimentary basins and the high percentage of successful "wildcat" exploration wells.

Truck-mounted crane in folded and extended positions.

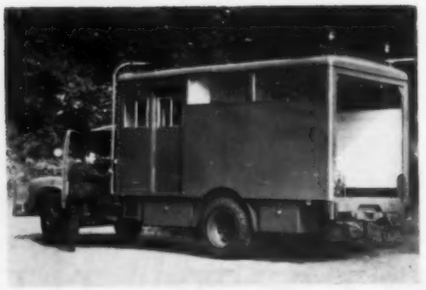
New £800,000 Plant at Stanlow

Work is in progress on a new plant for the production of an important aviation-gasoline blending component at Stanlow refinery, Ellesmere Port, Cheshire. This new Udex unit, as it is called, designed by Universal Oil Products and costing £800,000, is expected to be in operation by the middle of the year. As feed stock, it will use the products from the nearby £3½ million Platformer completed in 1953. The design incorporates six columns—the two tallest being the 120-ft solvent stripper and the 77-ft extraction column. Operated by Shell Refining Co. Ltd., Stanlow refinery with a crude-oil throughput of 5,200,000 tons a year is today one of the most comprehensive in Europe.

The Udex unit will be of the solvent-extraction type, using special solvent mixture. The platformate feed stock will be extracted with the glycol mixture which preferentially dissolves the aromatic components of the feed stock. The aromatic extract is distilled off from the solvent and used in aviation gasoline; while the insoluble nonaromatic portion, or raffinate, will be used as an additional feed stock for other processes.

Mobile Cranes

R. H. Neal & Co. recently gave an interesting demonstration of their range of mobile cranes at their works at Grantham, England. Of particular value to the oil industry, these cranes—of which there are many different models—are capable of handling any type of load, and of traveling over almost any sort of country. One of the outstanding features is the new patent free-wheel mechanism which gives full differential action both forwards and in reverse while eliminating any possibility of loss of drive through wheel spin. This means that, even if one wheel gets bogged in mud or loose sand, no wheel spin occurs, and the drive will be taken up by the wheel on solid ground—enabling the crane to continue being driven normally. Other features include hydraulic clutch control, power steering affording effortless maneuverability, a hoist unit capable of both speed and the precise placing of load, wide range of easily interchangeable jibs, and full-circle slewing over 360 deg with no dead spots where maximum load cannot be lifted. Besides the self-propelled cranes, truck-mounted models are also available.



Mobile workshop for field repairs in Venezuela built to Shell oil designs. Shell photo.

Speedier Cargo Handling

A new system of cargo handling, designed to expedite ground handling of air cargo, is said to permit the loading of 35,000 lb of cargo into a turboprop air freighter in 40 sec and to permit equally rapid unloading. According to the Aircraft Industries Assn. of America, tests indicate that the new method can lead to 40% reduction in manpower needed to prepare and load freight, and a 90% reduction in the idle ground time now necessary for transports while cargo is loaded and unloaded. The system depends on the use of pallets on each of which loads of up to 3½ tons can be tied. The pallets rest on rollers at the dock, or warehouse, and can be moved onto trucks which have rollers on the truck beds. An electric winch pulls the pallets into the cargo hold of the aircraft, which is also equipped with rollers on the floor.

New Swedish Turbine Tanker

Kockmus Shipyard at Malmo, Sweden, reports the delivery of a 24,900 dwt turbine tanker, "Gefion," for Tankrederiet Gefion A/S, Oslo. The vessel is of all-welded construction; the trial speed was 15.5 knots; and propulsion is by means of one set of Kockum-Laval double reduction-geared turbines developing 9,200 shp at 108 rpm. The ship is equipped with all current technical and navigational aids. The quarters—consisting of single cabins throughout—the mess rooms and day rooms, are all airconditioned. There are also a mechanized laundry and a drying room, as well as a darkroom and hobby room. A cafeteria is provided for the crew. The "Gefion" left Malmo the same evening she was delivered for the Persian Gulf, beginning a 5-year time-charter with Esso, London.

Personal

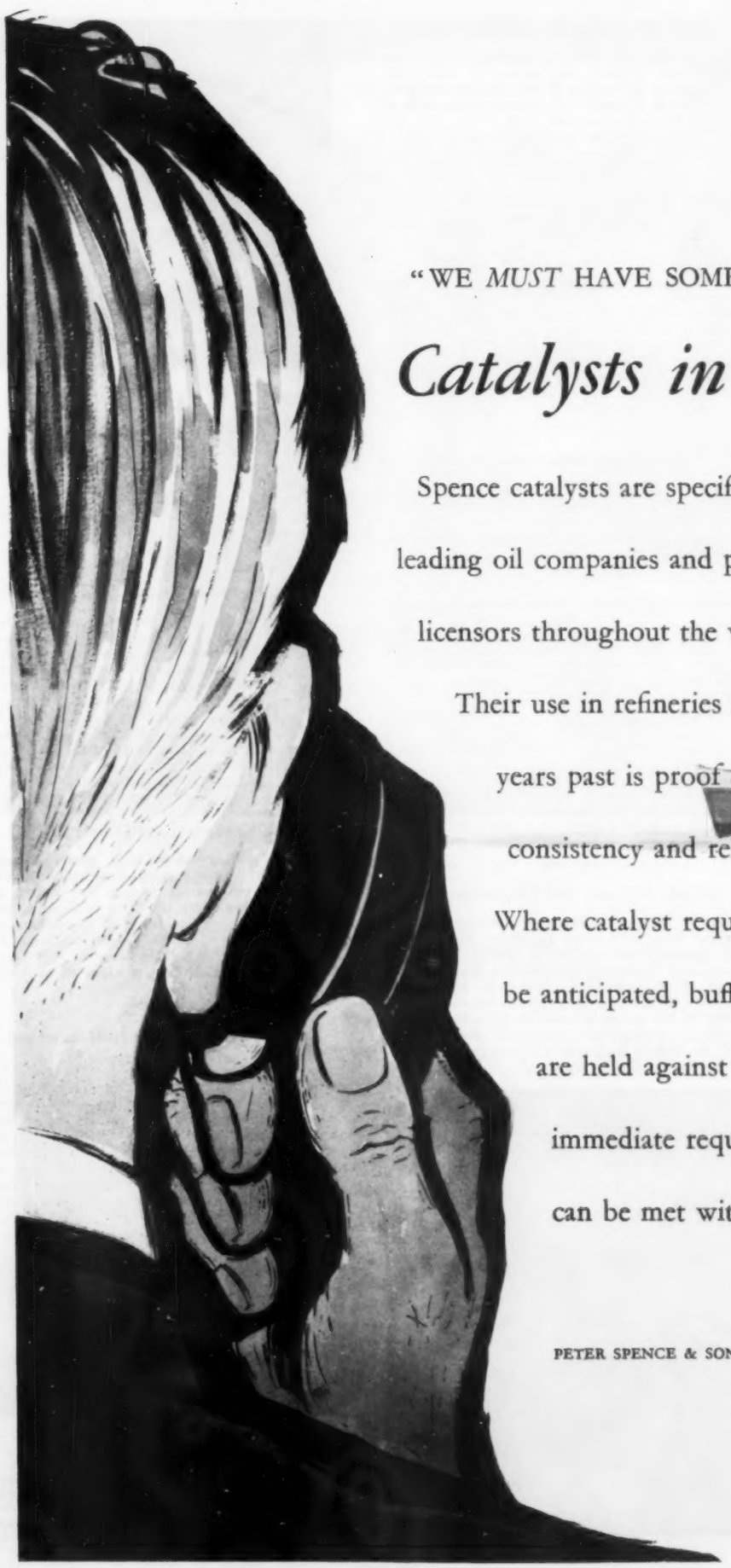
G. W. Searle has been appointed deputy chief accountant to the British Petroleum Co. Aged 44, he joined the company's accounts department, in London, in 1946.

New Synthetic-Rubber Plant

Matthew Hall & Co. Ltd. are constructing a new synthetic-rubber plant at Hythe, Hampshire, for the International Synthetic Rubber Co., which will have an annual output of 50,000 tons. As subcontractors to Blaw-Knox Co. of Pittsburgh, Matthew Hall & Co. have already carried out the design and procurement contract for this plant, which is expected to cost about 5 million.

Consumption in Scotland

Consumption of motor spirit in Scotland decreased 46,515 tons in the first three quarters of 1956, according to the UK Petroleum Advisory Committee. Total inland oil consumption rose 61,179 tons to 1,756,609 tons. Consumption of gas, diesel, and fuel oils rose 53,138 tons, to 689,661 tons.

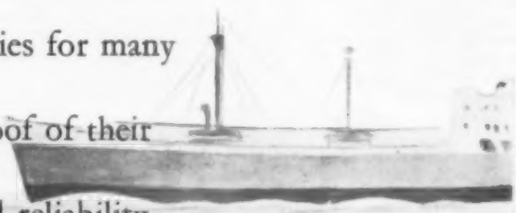


"WE *MUST* HAVE SOME

Catalysts in a hurry!"

Spence catalysts are specified by leading oil companies and process licensors throughout the world.

Their use in refineries for many years past is proof of their consistency and reliability.



Where catalyst requirements cannot be anticipated, buffer stocks are held against urgent needs and immediate requirements normally can be met without delay.

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Also at London and Bristol

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Canadian Notes

Western Canada Well Completions

Western Canada well completions in 1957 numbered 2,963 in all categories, including 1,417 for Alberta and 1,231 for Saskatchewan. For the first time in history, Saskatchewan development oil wells exceeded Alberta's, at 844 against 838. Low crude-oil markets caused slump in development drilling to 2,239 wells from 2,635 in 1956, but wildcatting increased to 724 completions against 650. Divergent trend is expected to continue in 1958, with total slightly reduced.

Gas for Ontario Communities

Substantial buildup of intermediate deliveries for Trans-Canada natural-gas line is seen in project of Northern Ontario Natural Gas Co. for 825 miles of lateral and local lines in northwestern and central Ontario, to be placed under contract by March 15. Northern has franchises for more than 30 communities in region, and plans to have them all tied in by November 1, 1958.

Contracts for Gas Exceed Supply

Alberta and Southern Gas Co. Ltd. has already over-contracted supply for its proposed natural-gas trunk pipeline to northern California from Alberta. It has completed firm contracts covering 625 mmcf per day average, while initial capacity of line will be only 450 mmcf per day. Fast growth may require even more than present contracts, but start date depends on retarded government policy, and may be deferred to 1960.

Taylor Heads CPA

Vern Taylor, Imperial Oil Ltd., has been elected chairman of the board of governors of the Canadian Petroleum Assn. He succeeds R. C. Brown of Hudson's Bay Oil & Gas Co.

Re-elected to the board of governors, in addition to Mr. Taylor and Mr. Brown, are: R. A. Cruickshank, Bart W. Gillespie, C. E. Leach, J. G. Spratt, and D. M. Tyerman.

Newly elected to the Board of Governors are: E. C. Babson, J. S. Black, W. C. Howells, Paul L. Kartzke, C. O. Nickle, and H. G. Sehnert.

Vern Taylor

Shell Canada Appointments

Paul L. Kartzke, vice president, Shell Oil Co. of Canada Ltd., Calgary, has announced recent appointments of D. O. Cole, Jr., as administrative assistant, and J. C. Ebbels as area land agent—both in Calgary. Mr. Cole succeeds J. M. Killey, who has been reassigned to the legal department.

Succeeding Cole as area land agent will be J. C. Ebbels, formerly a solicitor in the legal department.

R. F. Winfield succeeds J. A. Rose as controller. The latter recently was appointed vice president and treasurer, succeeding O. B. Roger, retired. Winfield previously served as treasurer at Vancouver.

B-A Personnel Changes

British American Oil Co. Ltd announces appointment of A. R. Nicholson as tax and insurance supervisor, Calgary. He succeeds J. B. Fraser, recently transferred to comptroller's office, Toronto. At the time of the acquisition of Canadian Gulf Oil Co. by B-A, Mr. Nicholson served as tax and insurance coordinator.

To Explore Oil-Sands Lease

Shell Oil Co. reportedly has started exploratory operations on a bituminous-sands oil lease covering nearly 50,000 acres on the banks of the Athabasca River. Six drill-sites have been spaced out on one legal subdivision.

Manitoba Refinery to Increase Capacity

Proposed capacity of a refinery to be built this year at The Pas, in northern Manitoba, by Excelsior Refineries Ltd., Edmonton, has been doubled to 4,000 b/d over an originally planned capacity of 2,000 b/d.

February Exports at All-Time High

Crude exports to north central states were at all-time high for February, at scheduled 75,918 b/d, a gain of 3,000 b/d over January. Saskatchewan and Manitoba supplied 57,286 b/d—a new high; and Alberta 18,632 b/d.

Heads Calgary Oil Department

John A. Baines, now assistant manager of the Bank of Montreal's main Edmonton branch, has been appointed manager of the bank's oil and gas department, Calgary, succeeding the late C. A. P. Leahey. Mr. Baines, who has been in his present appointment for the past 2½ years, joined the B of M in 1929. He has served at branches in Saskatchewan, Alberta, and Ontario, and at the head office in Montreal. Mr. Baines took over as manager of the oil and gas department on March 21.

J. A. Baines

F. A. McKinnon

FRED A. McKINNON has been appointed exploration manager of Triad Oil Co. Ltd., Calgary. Mr. McKinnon spent seven years with Imperial Oil Ltd., engaged principally in geological field work in western Canada. In 1949, when Royalite Oil Co., Ltd. became independent, Mr. McKinnon transferred to that company as exploration manager, which position he held until joining Triad.

Acquire Oil-Sands Permits

Six permits of about 50,000 acres each have been sold by the Alberta government in the oil-sands region to the following companies in the first sale of this type by public tender: French Petroleum Co.; Northwestern Exploration Co. Ltd., Texaco subsidiary; Tercol Petroleum Ltd., Imperial Oil subsidiary; Canadian Kewanee Ltd.; and Shell Kootenay Exploration Ltd. Tercol took two of the six permits. Prices ranged from approximately $25,000 to over $55,000 for individual permits in the sale, which netted the government about $215,000.

Well Completions Down 20%

January well completions in western Canada were down 20% from previous January, at 190 wells against 232; but average footage was higher, and total footage down only 11%. Due to larger proportion of wildcats and concentration in northern Alberta, where drilling time is longer, number of rigs at work is almost as high as last year (226 against 238). Development drilling is expected to decline further in summer.

Borden Commission to Report on Gas Exports

The Borden royal commission on energy sources in Canada has promised an interim report on natural gas, as full hearings are expected to last until near end of 1959. Industry opinion is the report will cover specifically gas export. Alberta utility companies and consumers have upped their demands for protection of future domestic supply, asking assurance of constant surplus of 30 years' requirements ahead at any given time in future.

The Pipe Line Contractors' Assn. of Canada held its fourth annual convention recently in Victoria at the Empress Hotel. Featured speakers shown above are (left to right): General James Doolittle, Shell Oil Co. executive, who addressed delegates, followed by J. Lance Rumble of General Motors Products of Canada and Dr. William Campbell of the Atomic Energy Commission of Canada. R. K. 'Ron' Banister of Edmonton, pioneer western Canadian Pipe Liner, is association president.

The British Petroleum Company is establishing hundreds of service stations, and training local talent to operate them in West Africa, where twice as many motorists are now fuelling at BP stations as three years ago.

West Africa on Wheels

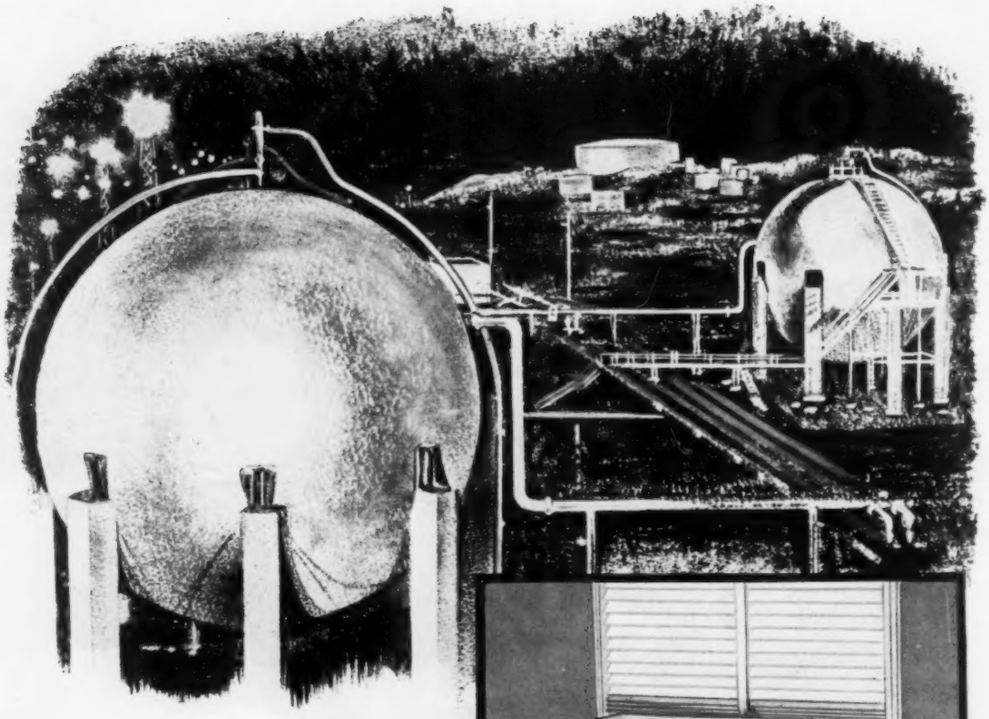
IN AN AREA larger than Europe – where one's next door neighbour may live hundreds of miles away – roads are West Africa's vital arteries, and petrol its life blood. Anyone who helps transport along in West Africa to-day is contributing in a vital way to its economic and cultural future.

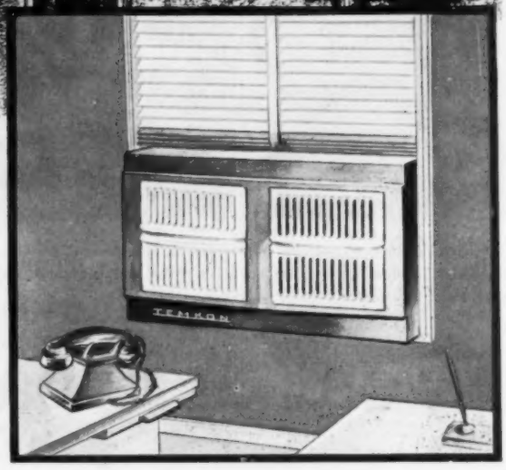
Operating in more than twenty West African countries, whose combined area exceeds 5,000,000 square miles, BP is making three great contributions to transport development: by supplying petrol and lubricating oils that withstand the extremes of West African weather; by steadily extending its network of service stations; by training local talent to operate them safely and skilfully.

Oil is helping to raise West Africa's standards of living and will increasingly do so. There, as elsewhere throughout the world, The British Petroleum Company is speeding the wheels of progress.

THE *British Petroleum* COMPANY LIMITED

BP





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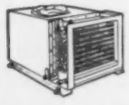
The experience and know how of Temperature Ltd., is at your service.

Self-contained air-cooled, condensing units 4 to 25 h.p.

Packaged Chilled Water Unit 45 GPH 6PH



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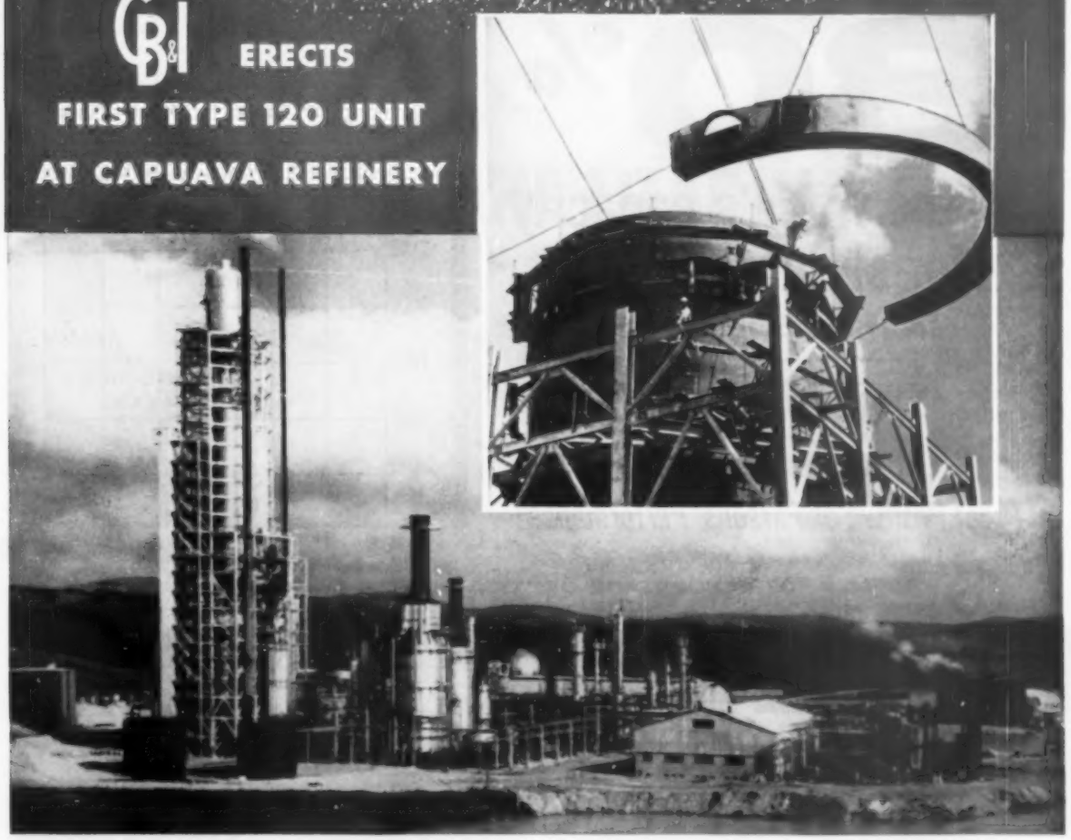
Brazilian Refinery gets LARGEST TCC UNIT

CB&I ERECTS FIRST TYPE 120 UNIT AT CAPUAVA REFINERY



• At Capuava, north of Sao Paulo, Brazil, a main fractionating tower and the *first* type 120 Thermofor unit built was erected by CB&I in cooperation with their subsidiary, Sociedade Chibridge de Construcoes, Ltda. Both units were fabricated at our Greenville, Pa. plant and furnished through Hydrocarbon Research, Inc., New York, for Refinaria e Exploracao de Petroleo "UNIAO" S.A. The refinery has a crude capacity in excess of 20,000 bbls. per day.

Top: An air duct section for the TCC kiln being raised into place.

Bottom: General view of Capuava Refinery.

• CB&I has *complete* facilities for designing, fabricating and erecting welded steel plate structures for the petroleum industry. Write our nearest office for details.

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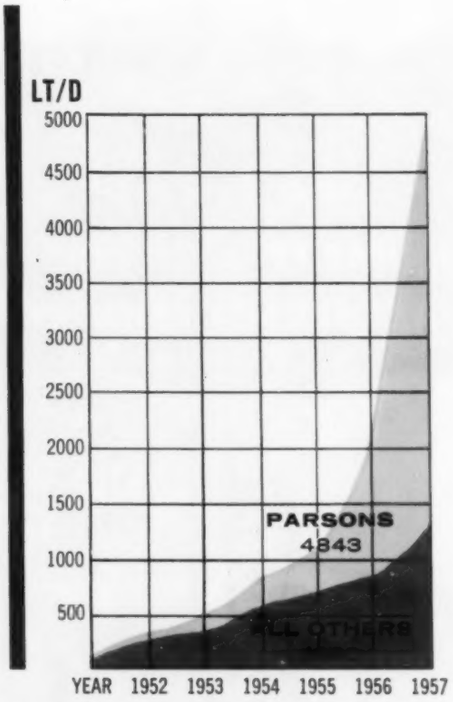
Since 1952 approximately

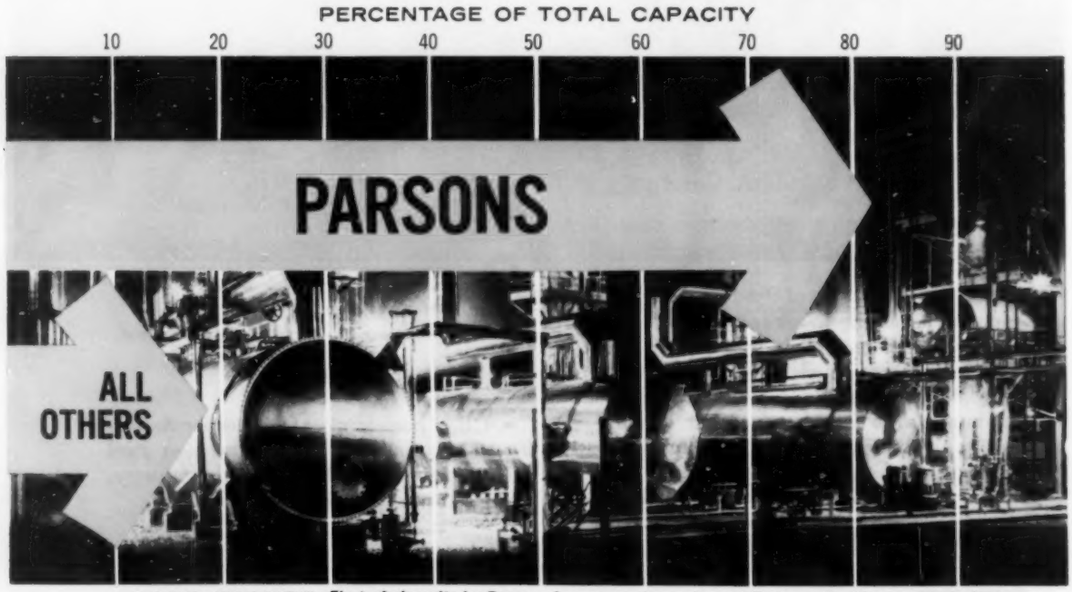
80%

of the world's capacity for sulfur recovery from H_2S gas is by

PARSONS

Proof Positive of Parsons' Performance!





LACQ, FRANCE: First of six units by Parsons is now on stream in world's largest sulfur recovery plant.

PARSONS means leadership

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REDUCE LOADING COSTS...

Increased efficiency and substantial cost reduction are two distinct benefits a Chiksan Marine Loading Arm brings to your tanker transfer operations. With a Chiksan Marine Loading Arm, three men can do the job that formerly required seven men and in just one-third the time.

Add to this the safety factor of all-metal lines, the drastic reduction of hose handling accidents, and hose replacement cost. Consider too, the safety and convenience of clean, uncluttered docks, and the simplifying of flanging up during bad weather. To these add the healthy savings in lower insurance and compensation premiums.

Put these benefits together and you will quickly see how Chiksan Marine Loading Arms can reduce loading costs, speed tanker turnaround time at your loading terminals. Let Chiksan submit a specific proposal for your terminal facilities. Write today.

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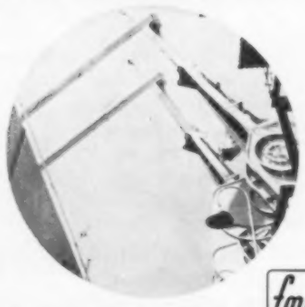

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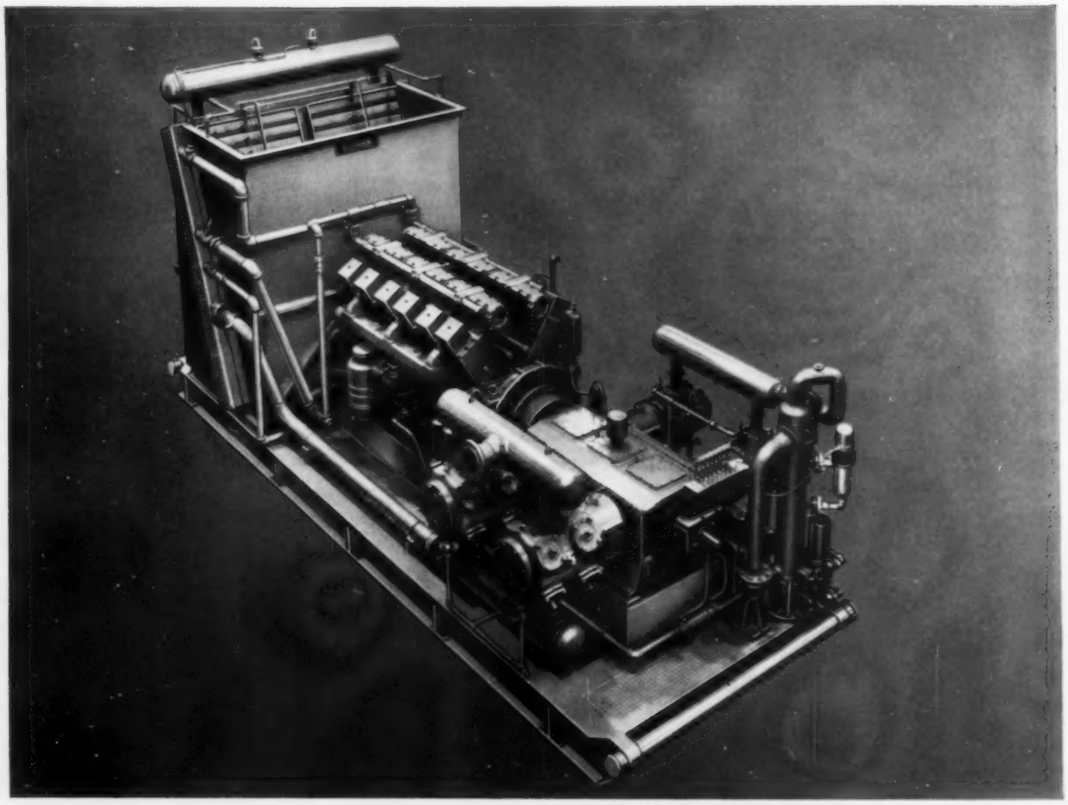


The Clark model CFA-4 is a completely self-contained compressor station. It is built in eight sizes ranging from 200 to 350 bhp.

Clark CFA balanced/opposed compressors are completely packaged for rugged field service

Portable, proved and popular, Clark CFA compressors are specifically built for air drilling, gas lifting, gas gathering, boosting, testing, repressuring, and other exacting oil-field services. These packaged units are available in two and four cylinder models, in sixteen sizes, covering a range of 100 to 350 bhp.

Direct drive assures greater efficiency

In the CFA, Clark engineers have done away with power-robbing, troublesome gears and belts between the engine and the compressor. A simple rubber block coupling takes their place. This direct drive feature is made possible by the perfect balance of the Clark CFA. It explains how the compressor can operate at a modern 1000 rpm. The direct drive design is also responsible for considerable reduction in skid size and in housing costs.

Balanced/opposed design eliminates vibration

Compressor cylinders are mounted on opposite sides of the crankcase and are connected to crankthrows which are 180° apart. With this arrangement, reciprocating masses, which are of equal weight, are always moving in opposite directions. Because there are no unbalanced forces, vibration is practically non-existent and operating costs are cut down and kept to a minimum.

Easier to install, move or shelter

Since the CFA is a self-contained compressor station, installation presents no problem. Just enough concrete to level the unit is all that is required. Clark CFA's are excellent compressors for swamp country, as well as barge and truck mountings. For air drill-

ing, you can even mount the compact CFA on timbers. It won't "walk" away.

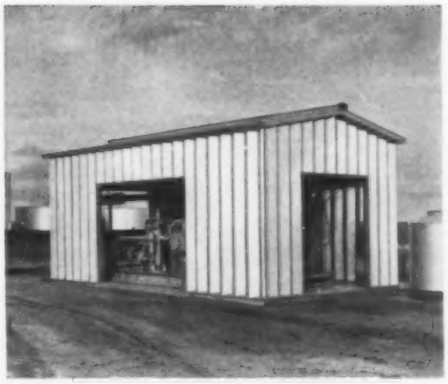
Unitized radiator simplifies cooling

All cooling services are efficiently handled by the unitized radiator built right on the skid . . . and include engine water jacket, compressor cylinder water jacket, lube oil cooling, and as required, inter and after cooling of the gas stream.

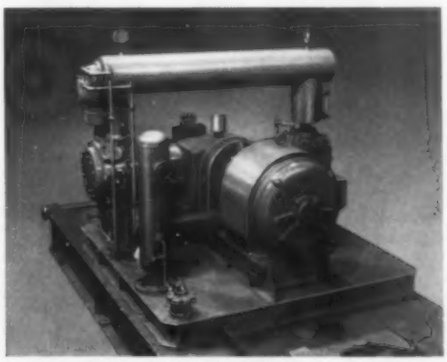
CFA contains many "big compressor" features

Into the sturdy Clark CFA have been built many "big compressor" features. These include a steel crankcase, a one-piece forged steel crankshaft, forged steel connecting rods, precision bearings, and forced feed lubrication. You will find that you'll deplete the field, but you won't wear out the Clark CFA.

The Clark *encyclopedia of experience* – in design, manufacture, and application is always at your service. For complete data on all CFA balanced/opposed compressors, call your nearby Clark engineer. Or write today for the new Composite Catalog, Bulletin No. 151 to Clark Bros. Co., 1505 Lincoln Avenue, Olean, N. Y. Clark is one of the Dresser Industries and maintains sales and service outlets in principal cities throughout the world.

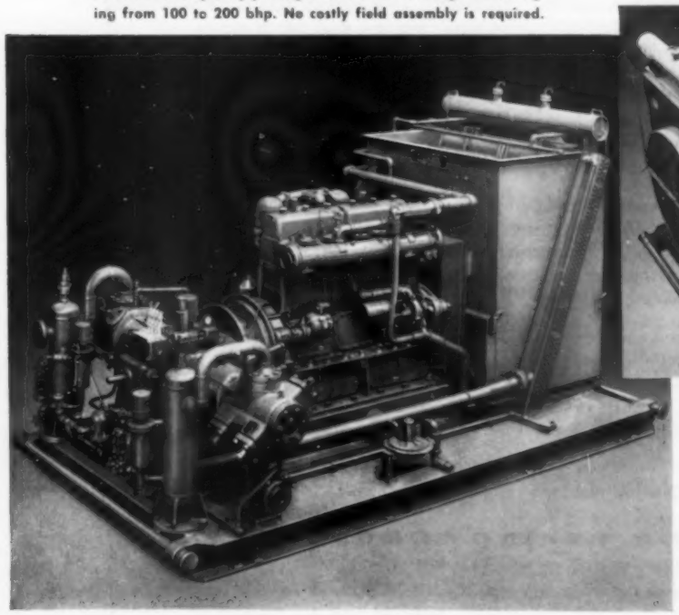


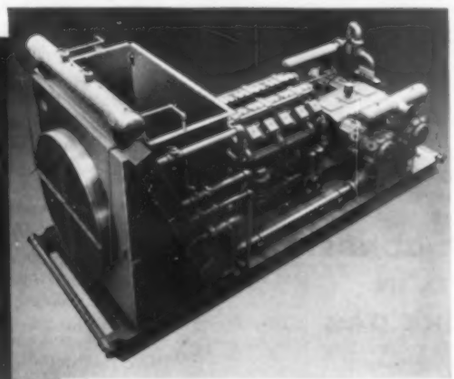
Here a 128 bhp Clark CFA-2 does heavy duty in a field installation for gas gathering. Note the simple installation.



The CFA-2 is also available in electric motor driven units if desired. Illustrated is the 100 bhp model.

Below: The completely packaged CFA-2 comes in eight sizes ranging from 100 to 200 bhp. No costly field assembly is required.





The unitized radiator in this CFA-4 handles *all* cooling services in one efficient operation. Piping is confined to skid for maximum protection.

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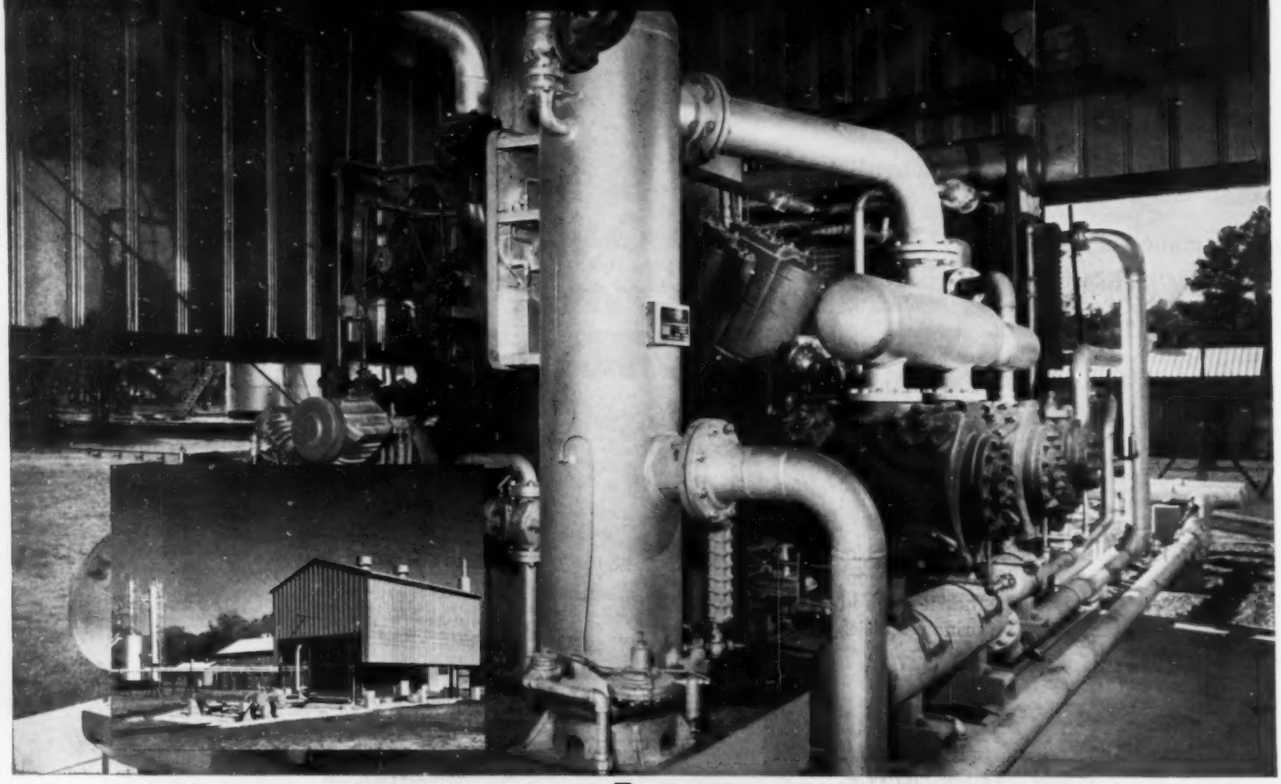
BEAIRD-INGERSOLL-RAND Packaged Compressor Plant



H. M. Harrell Recycling Plant booster station -- equipped with a Beaird - Ingersoll - Rand 6SVG 330 h.p. four cycle gas engine driven packaged compressor plant. Young radiator with lubrication oil cooler and gas coolers, and all necessary controls for unattended operation. Other sizes 120 to 660 h.p.

At Large Recycling Plant–

PACKAGED COMPRESSOR CONSERVES 2,000,000 CFD. IN LOW PRESSURE GAS

another AMF product
PACKAGED COMPRESSOR PLANTS

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THE H. M. HARRELL RECYCLING PLANT serves a dual role. It represures wells in the Bammel Field and injects gas into formation storage for a large Texas utility. Designed to operate with 400 psig. suction, the original plant was unable to pick up 2 mmcfd. in low pressure gas produced by five nearby wells. This gas has now been added to the plant through the installation of a Beaird-Ingersoll-Rand 6SVG 330 h.p. packaged compressor.

Picking up from the wells at 20 to 25 psig. the Beaird unit boosts the gas through two stages delivering it to the plant compressors at 450 psig. Critical input gas temperatures at plant compressors were met by equipping the packaged compressor radiator with gas interstage and after cooling sections.

The packaged compressor has been designed for unattended operation. Its driving engine is equipped with a regulator which enables the speed to vary from half to full throttle, controlled by the suction pressure. Discharge pressures remain constant. Other controls and shutdown devices protect unit from unforeseen operating conditions.

Let us show you how a Beaird-Ingersoll-Rand packaged compressor can be designed to meet your special requirements.

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DU PONT *Petroleum Chemicals* NEWS

Number 86 in a Series of Bulletins for the Petroleum Industry

APRIL 1958

Knowing what really makes motorists buy HELPS DEALERS SELL

Still another in a series of Du Pont-sponsored surveys has been completed by National Analysts, Inc. The findings are now available in booklet form.

The survey report discloses what emotional reactions influence motorists to choose a service station, a brand of gasoline, a TBA product.

Psychological needs

The psychologists in conducting the study determined that there are four basic needs which can be fulfilled through purchase of service station products and services:

1. **Play**—use of car for recreation
2. **Aggression**—desire for speed and fast acceleration
3. **Conservance**—need to preserve car as an investment
4. **Infavoidance**—the desire of motorists to avoid the *appearance* of inferiority

Specific products

Gasoline sales, as you might suspect, are most influenced by the play and aggression needs. This finding indicates that gasoline advertising should appeal to motorists' desire for recreation and powerful car performance.

It was found that motor oil and grease satisfy the conservance need. The promotion of these products should be directed accordingly. Body polish, which might be thought to satisfy the conservance need, actually gratifies more often the need for infavoidance. So do white sidewall tires.

Anxiety influences

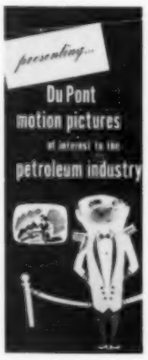
Two of the areas explored were anxieties about product quality and service.

Apparently women drivers are more concerned than men about tire quality and repair. This may be because a flat

Continued – over

Du Pont movies available for oil company showings

During recent years, the Du Pont Company has produced a wide variety of 16 mm sound motion pictures. Several of these are of direct interest to personnel in the oil industry.



Some of these films – such as *It Never Rains Oil* and *What Makes a Gasoline Good* – were made expressly for oil company use by our Petroleum Chemicals Division. There are a number of films also on farming, sports, safety, public relations and various industrial subjects. These films make excellent pro-

Continued – over

ADVERTISEMENT—Prepared for the Petroleum Chemicals Division of E. I. du Pont de Nemours & Company (Inc.)

OVER

DU PONT *Petroleum Chemicals* NEWS

CONTINUED **New Survey**

tire is a greater inconvenience to women.

Women appear to have also a more generalized anxiety over automotive products they buy. This is possibly due to their having, in general, less mechanical knowledge than men.

Perceptions of service stations

Motivational needs lead to motorists' perception of different service stations as places to do business. Perception is influenced also by the opinions of others, including families, and by advertising and promotion of the dealer or the company he represents.

A summary of the findings of the survey are available in book form for easy reference.

CONTINUED **Du Pont Movies**

gram material for dealer meetings and showings to customer groups.

Prints are available to oil companies on a loan basis, without charge.

All these Du Pont films are described in a new booklet "Du Pont Motion Pictures of Interest to the Petroleum Industry." The booklet gives information also about requesting the films for your own use. Any of our representatives or sales offices will be glad to send you a copy.

See the
DU PONT SHOW OF THE MONTH
on CBS

THE DU PONT TEL TERMINAL at Beaumont, Texas has complete modern facilities for the storage and handling of TEL, and rapid dispatch of tank cars of it.

Many refiners find pre-mixed additives more convenient

The combination "package" of Du Pont Fuel Oil Additive No. 2 pre-mixed with Du Pont Metal Deactivator has now been available to refiners for a year.

We've heard many favorable comments on this new combination from refiners who have tried it. It has proved a convenience to be able to use a single additive with combined properties that guard against practically all the major chemical causes of heating oil and diesel fuel troubles, specifically sludge and gel accumulations.

The new combination is available to you in drums in two different concentrations . . . FOA-208—92% FOA-2, 8% DMD; and FOA-212—88% FOA-2 and 12% DMD.

Magic Barrel presentation has pierced the iron curtain

Parts of the oil industry's "Magic Barrel" presentation have been recorded and broadcast to people behind the iron and bamboo curtains as well as to those in free countries of the world.

Members of the Voice of America staff first became acquainted with the Du Pont-designed Magic Barrel when visiting the company to develop a special program using the voices of approximately 100 foreign-born and native American Du Pont employees. At this time, the Magic Barrel was shown to the Voice staff to acquaint them with the group of Du Pont products made from oil. They saw in this presentation some of the fruits of American enterprise—presented in a dramatic and convincing fashion. So they asked to have parts of it taped for broadcasting to their listeners.

The Voice of America program is the first concerted effort to tell the story of an American company in many languages.

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Los Angeles 17—612 So. Flower St. . MAdison 5-1691
New York 20—1270 Ave. of the Americas . . . COlumbus 5-2342
Philadelphia 2—3 Penn Center Plaza . LOcust 8-3531
Pittsburgh 22—1 Gateway Center . . . ATlantic 1-2933
San Francisco 4—111 Sutter St. . . . . EXbrook 2-6230
Seattle 3—4003 Aurora Ave. . . . . MElrose 6977
Tulsa 1—1811 So. Baltimore Ave. . . . LUther 5-5578
In Canada—Du Pont Company of Canada (1956) Limited, Petroleum Chemicals, 85 Eglinton Ave. East, **Toronto 12**—Ontario . . . . . HUdson 1-6461
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Du Pont Tetraethyl Lead and other Petroleum Additives

OVER

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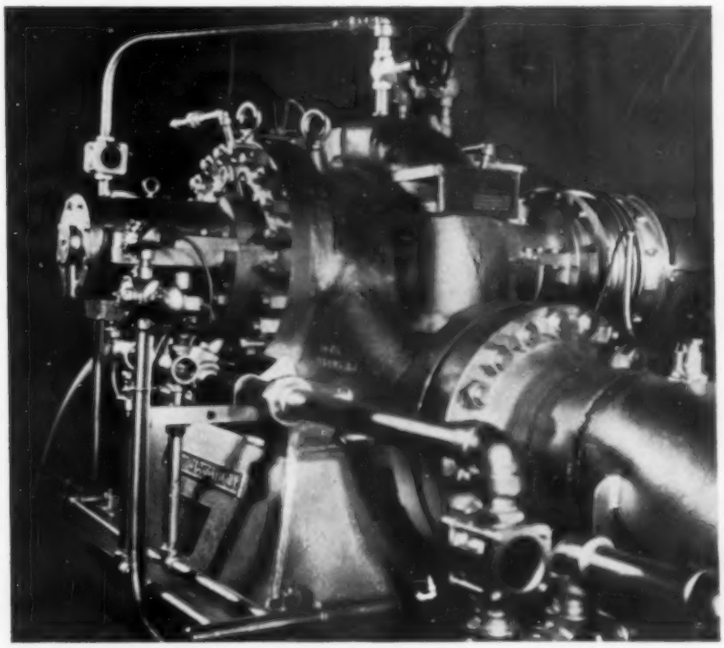
NEW HIGH-SPEED BJ PUMPS BOOST PIPELINE PERFORMANCE RECORDS



Boost Trans-Arabian capacity by 25%!

NEW BJ HIGH-SPEED pipeline pumps are proving themselves in rugged, unattended service on the world's largest single long-distance pipeline. Nine BJ centrifugal pumping units, installed on the 1,000-mile trans-Arabian pipeline system, have increased the capacity of the system by 25%—from about 350,000 b/d to 435,000 b/d!

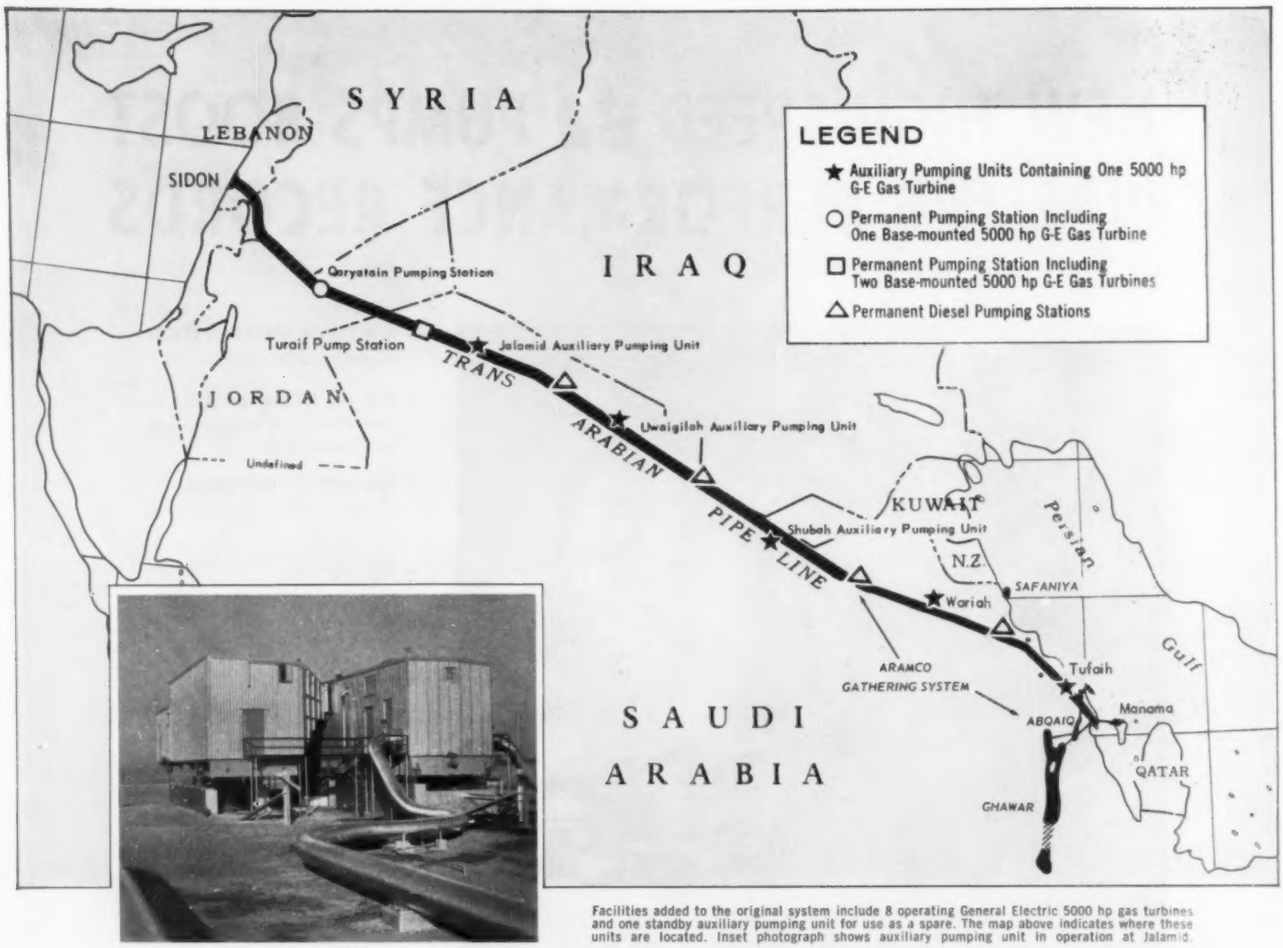
To effect this increase in throughput capacity, five of the BJ Pumps were installed in auxiliary pumping units at isolated locations between existing pumping stations, with a sixth auxiliary unit for a "spare." The other three BJ Pump units were permanently installed. The auxiliary units are mounted on portable vans to permit rotation and periodic overhaul at a central shop. They operate *unattended* and remote-controlled by radio from permanent stations 50 to 100 miles away.

The trans-Arabian pipeline installations are further evidence of Byron Jackson's continuing leadership in the design and manufacture of rugged, compact, reliable pumps for the pipeline industry. This experience is available to assist you in finding time-and-money-saving solutions to your pumping problem.

- **NEW HIGHER OPERATING SPEED!** Operates at 5250 rpm.
- **NEW GAS TURBINE DRIVE!** 5,000 HP two shaft combustion gas turbine drive
- **NEW COMPACT DIMENSIONS!** Pump is only 5'1" long, 4' wide and 4' high.
- **NEW REDUCED WEIGHT-TO-HORSEPOWER RATIO!** Weighs 4650 lbs.—only $\frac{7}{8}$-lb. per horsepower!
- **NEW SIMPLIFIED DESIGN!** Rugged single-stage, double-volute, double-suction, end pull out, circular-confined gasket construction with minimum span between bearings for long, maintenance-free operation.
- **NEW INCREASED OPERATING HEAD!** Operating head is 1600 ft. For operation near closed valve at overspeed trip setting of 5900 rpm, developed head is 2600 ft.—a new high.
- **NEW HIGHER SUCTION PRESSURE ON START-UP!** Unique pump/mechanical seal combination allows 500 lb. suction pressure on start-up, in addition to high developed pressure.
- **NEW LARGER SHAFT DIAMETER!** Larger shaft diameter lowers bearing span/shaft diameter ratio to 9.3 with static deflection of less than .003". Unit can be run dry without wear ring damage!
- **NEW STUFFINGBOX RELIABILITY!** Pump has BJ Mechanical Seals designed for 500 psi suction pressure.
- **NEW IMPELLER DESIGN— NO WEAR RINGS!**

BYRON JACKSON PUMPS, INC.
A Borg-Warner Subsidiary
BOX 2017-A, TERMINAL ANNEX, LOS ANGELES 54, CALIFORNIA

BJ SINCE 1872



Facilities added to the original system include 8 operating General Electric 5000 hp gas turbines and one standby auxiliary pumping unit for use as a spare. The map above indicates where these units are located. Inset photograph shows auxiliary pumping unit in operation at Jalamid.

How General Electric helps increase pipe line capacity 40% on the 1000 mile Trans-Arabian pipe line system

Installed cost of unattended G-E gas turbine units only one-sixth the investment of conventional community-type stations

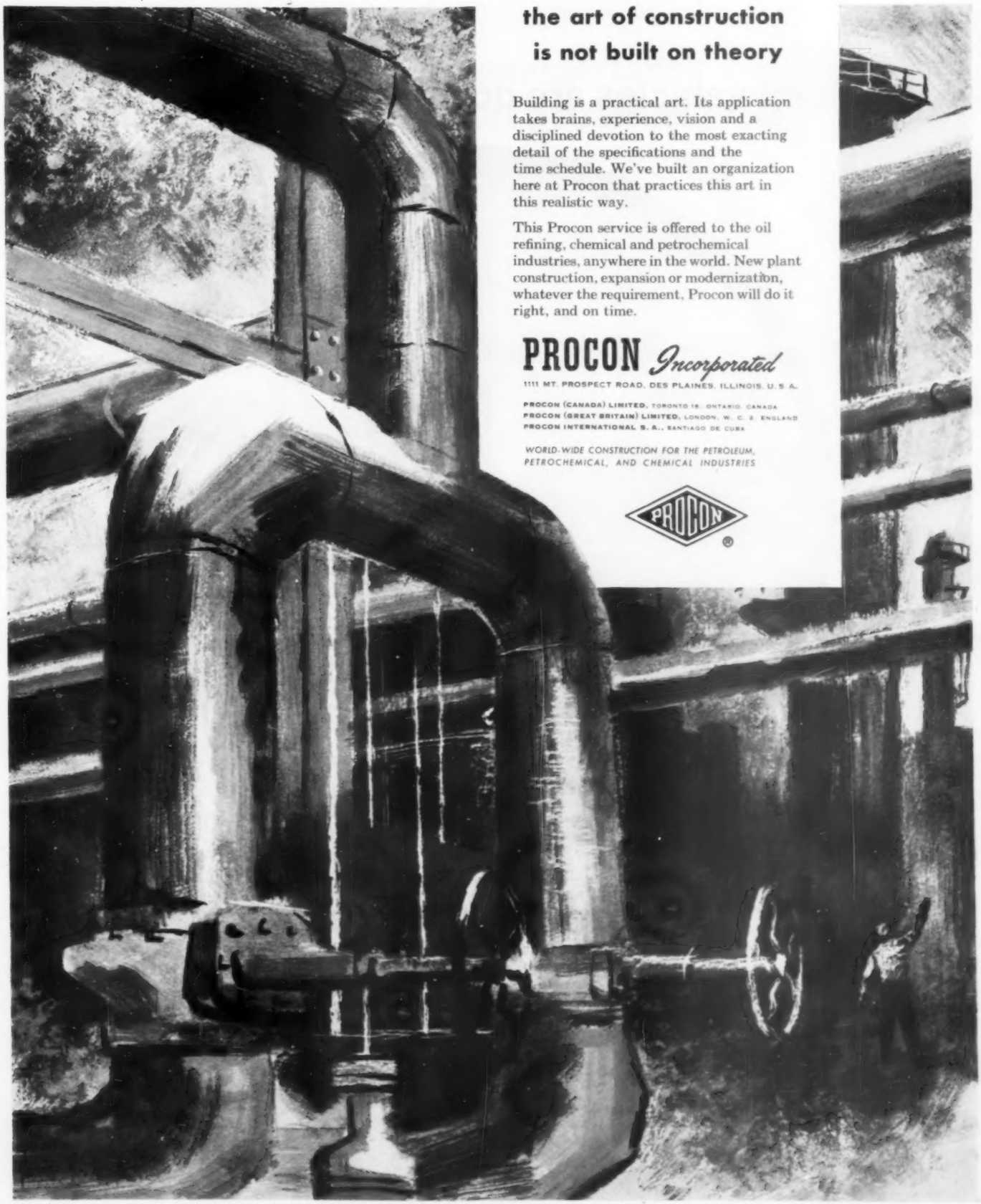
It takes plenty of power to pump petroleum through the 1000 mile Tapline and Aramco pipe line system. To gain even greater capacity from the existing pipe line system, Trans-Arabian Pipe Line Company and Arabian American Oil Company turned to General Electric.

For optimum economy they decided to install specially designed auxiliary pumping units that would be both remotely controlled and portable. Adhering to Tapline specifications, General Electric undertook to build these units. The entire system was planned to include six portable simple-cycle G-E combustion gas turbines and 3 permanent base-mounted gas turbines each rated at 5000 hp. The gas turbines of the auxiliary pumping units were housed in portable vans. They were designed to be operated on an unattended basis and are radio-controlled by operating personnel at the main pumping stations 50 to 100 miles away.

When the initial portable unit went into operation, it marked the first time a turbine of this size was ever controlled remotely for continuous operation. This was also the first time a gas turbine had been fueled with crude oil taken directly from the pipe line.

When all installations are completed, total capacity of the pipe line will have been raised from 320,000 barrels of oil per day to 450,000—an increase of over 40%—providing maximum pumping power at minimum cost. For further information on how G. E. can help you with your power needs, consult your nearest G-E representative or write: *International General Electric Company, 150 East 42nd Street, Dept. 58-37, New York 17, N.Y., U.S.A.*

GENERAL ELECTRIC
—U.S.A.—



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This Procon service is offered to the oil refining, chemical and petrochemical industries, anywhere in the world. New plant construction, expansion or modernization, whatever the requirement, Procon will do it right, and on time.

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along the lease
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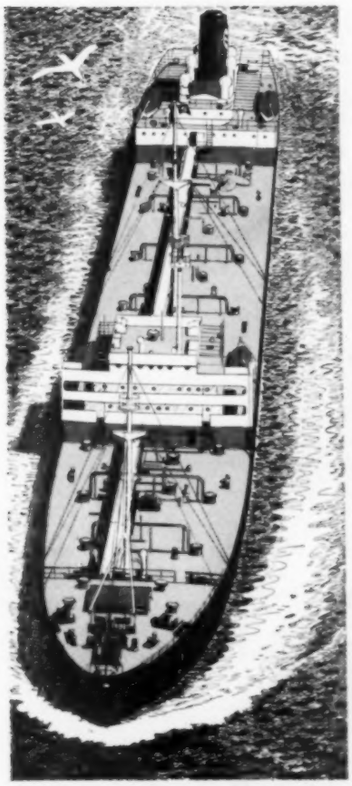
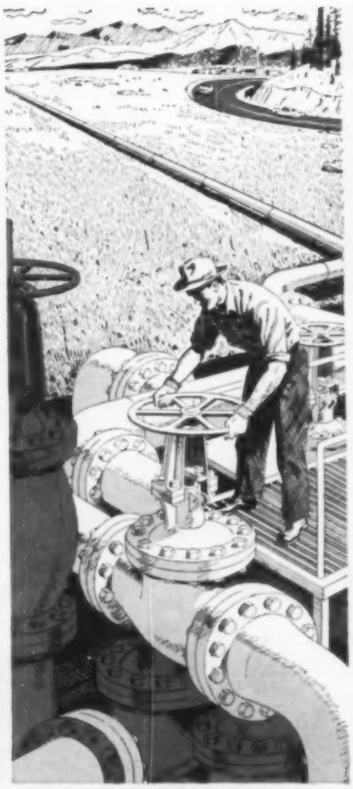
How Standard's busy transportation system helps hold down prices of petroleum products



Twenty-six Standard Tankers—plus others that we charter—sail the seas to keep crude oil moving to refineries and more than a hundred finished products returning to customers. A supertanker can hold enough gasoline to run your car over 10,000 years. On inland waters, tugs, barges and smaller tankers take over the transport job.



Rivers of crude oil and products flow through 3364 miles of pipelines that Standard operates in the Western hemisphere. Also, we pay to send products through other companies' pipelines. They in turn use our lines. Through these "steel arteries," oil is pumped over mountains, as high as 9500 feet, under rivers and through deserts.

Miles of railroad cars, thousands of trucks, trailers, and semi-tank trucks move finished products to distribution points, service stations, airports, marine stations, farms, factories and military installations. Standard either operates or leases nearly every form of transportation to keep vital oil supplies moving.

What's today's biggest travel bargain?—petroleum's trip from oil well to refinery to you, a journey that often covers thousands of miles by land, water and underground. To keep the "fare" low, Standard serves the Western hemisphere with a network of tankers, trucks, tank cars and pipelines.

They move oil in huge quantities carefully scheduled to match production at the well, refining capacity and our customers' needs. This far-flung transportation job is done at a cost so low it amounts to a fraction of the price per gallon—generally less than you pay to mail a postcard.

It's one way we work to keep down the price of the gasoline you buy.

STANDARD OIL COMPANY OF CALIFORNIA
plans ahead to serve you better

Petroleum progress means...

Transportation to deliver the 55% more oil U.S. will use by 1968

'Jeep' vehicles are doing the world's work!

along the lease
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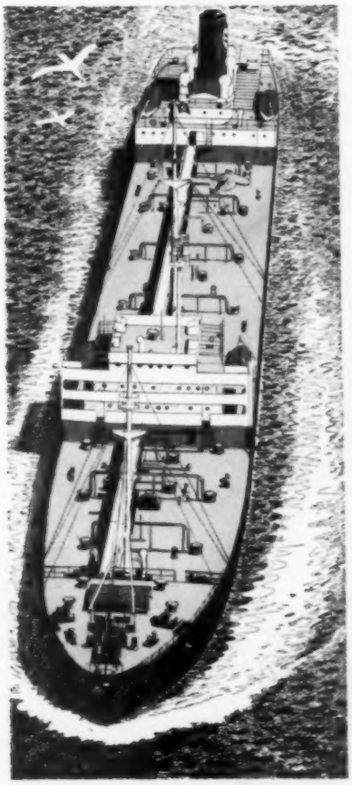

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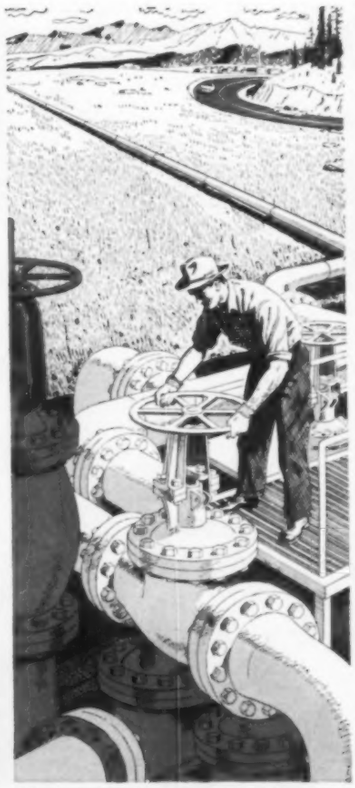

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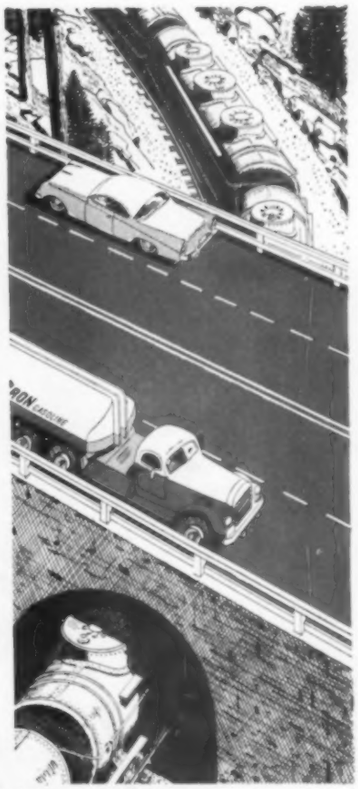

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STANDARD OIL COMPANY OF CALIFORNIA
plans ahead to serve you better

Petroleum progress means...

Transportation to deliver the 55% more oil U.S. will use by 1968

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Their combined capacity of 480,000 barrels will be devoted to the task of delivering petroleum, oils and lubricants for the armed forces—wherever needed. Each has an 18,000 mile range with a cruising speed of 18 knots.

Along with its shipbuilding ability, versatile engineering and craftsmanship have won Sun Ship world-wide prestige in other important industries. From its integrated shops Sun produces special fabricated steel components and equipment for the petroleum, petrochemical and chemical industries—plus special machinery for a "full house" of customers both large and small in many other industries.

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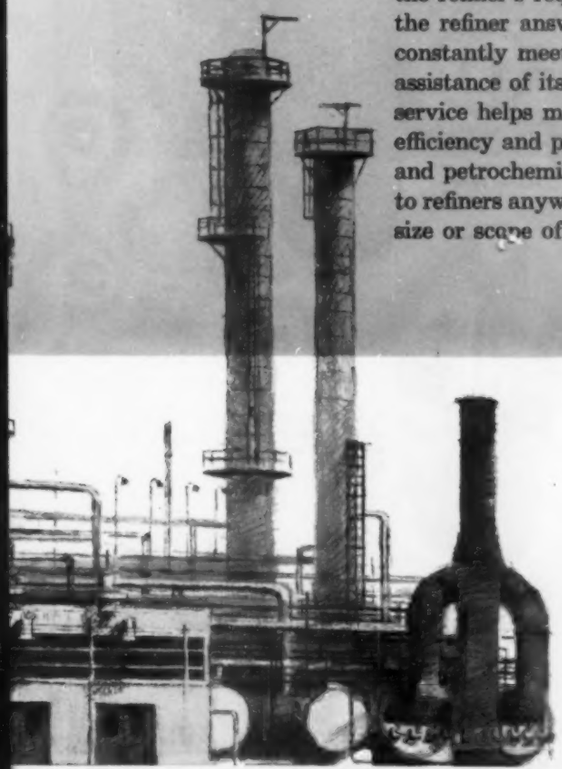

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Gas/Oil Ratio Effectively Reduced by Use of McCullough Logs

McCullough Gamma Ray-Neutron Logs (Scintillation Detector) and Caliper Log Pilot Way for Reduction of Gas/Oil Ratio from 1800 to 200 Cubic Feet Per Barrel

The accuracy of McCullough Well Logging Services assured the successful reduction of gas/oil ratio in this Canadian oil well.

Depth of operation was approximately 3200'. Seven inch OD 20 lb. casing had been set on top of the pay. Production was from 6⅛" open hole with a gas/oil ratio of 1800 cubic feet per barrel.

McCullough's Radiation Well Logger with Scintillation Detector was run to determine the depth and detail of the oil sand. Simultaneous Gamma Ray and Neutron Curves were recorded. Gas/oil contact was established from the Neutron Curve. Following this a McCullough Caliper Log obtained excellent detail of the open hole.

From this information a production packer was set and the well was put back on production. Gas/oil ratio decreased from 1800 to 200 cubic feet per barrel.

Accuracy plus reliability of down-hole information are prime requisites to the successful completion of jobs like this. And you can be sure of these qualities when you call for McCullough Well Logging Services.

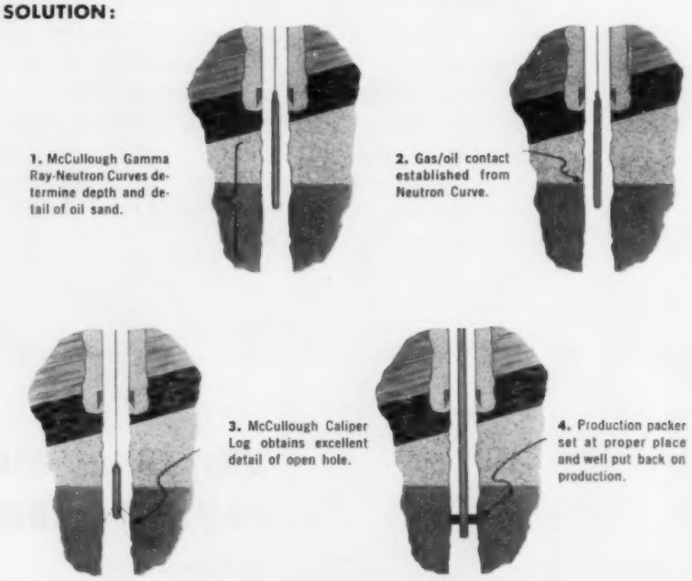
The job described above is certified to be a true field report of service rendered.

WANT MORE INFORMATION?

If you have not received our 12-page bulletin on McCullough Radiation Well Logger, just write McCullough Tool Company, 5820 South Alameda St., Los Angeles 58, Calif. We'll send your copy by return mail.

PROBLEM: Gas/oil ratio too high—1800 cubic feet of gas per barrel of oil.

SOLUTION:



1. McCullough Gamma Ray-Neutron Curves determine depth and detail of oil sand.
2. Gas/oil contact established from Neutron Curve.
3. McCullough Caliper Log obtains excellent detail of open hole.
4. Production packer set at proper place and well put back on production.

RESULT: Gas/oil ratio reduced from 1800 to 200 cubic feet of gas per barrel of oil.

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why is Caposite so strong?

It's no secret why CAPOSITE insulation is so strong and stands up to such rough usage. These pipe sections and blocks are made wholly of Amosite asbestos and the long fibres of this particular kind of asbestos give CAPOSITE its strength and resilience as well as its high insulating value.

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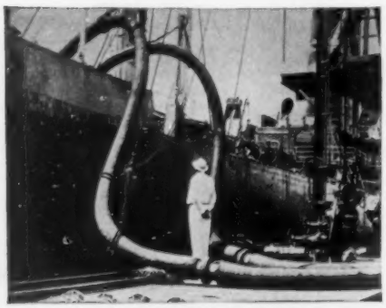
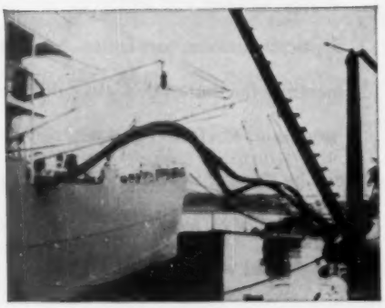


O S & D HOSE

ROTARY DRILLING HOSE



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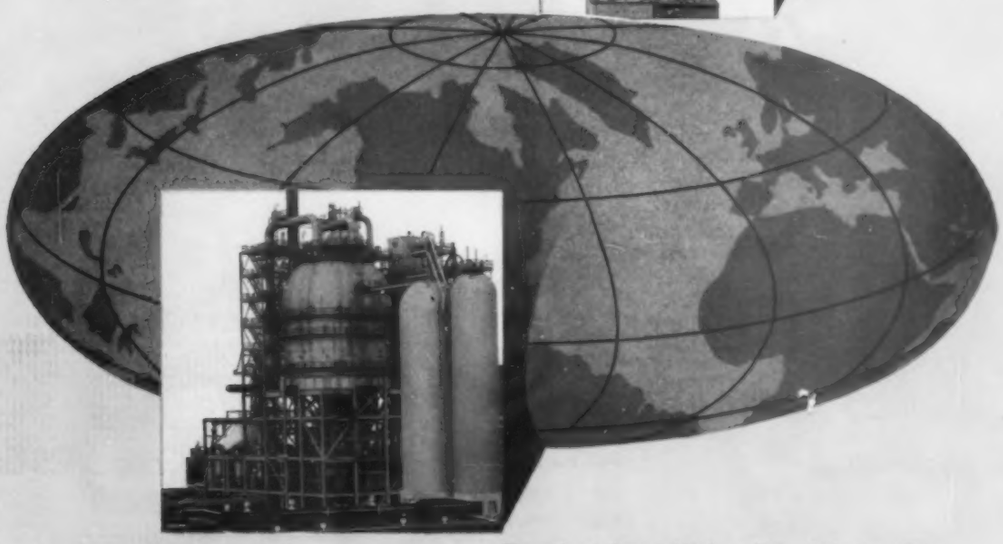

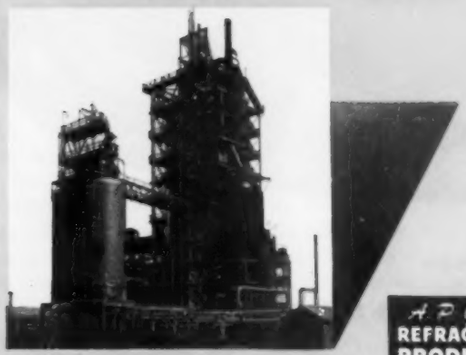

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CALTEX

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If you'd like more information about these services or specific engineering assistance, write to *Petroleum Sales Department, Westinghouse Electric International Company, 40 Wall Street, New York 5, U. S. A.*

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Suppliers of Fire Extinguishers *The Pyrene Company Limited*

making the oil world safer from fire

The many and varied fire dangers that are ever present in all stages of the processing and storage of oil call for nothing less than the finest modern methods of fire protection. In this field the highly developed and specialized equipment supplied by The Pyrene Company has a record and reputation second to none throughout the world. In the production of aviation and motor spirit, kerosene, fuel and lubricating oils, bitumen, petroleum chemicals, alcohols and solvents—and in their increasingly wide uses in industry—there are no fire problems beyond the scope of "Pyrene" Fire Protection.

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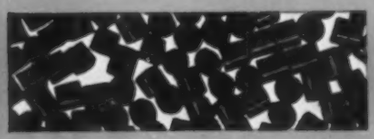
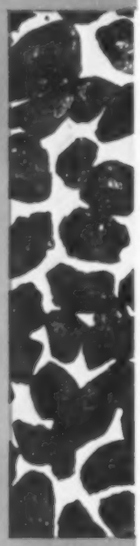
CANADIAN PLANT: Pyrene Manufacturing Company of Canada Limited,
91 East Don Broadway, Toronto, 8





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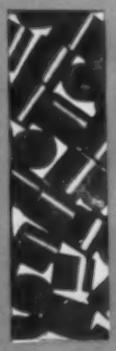

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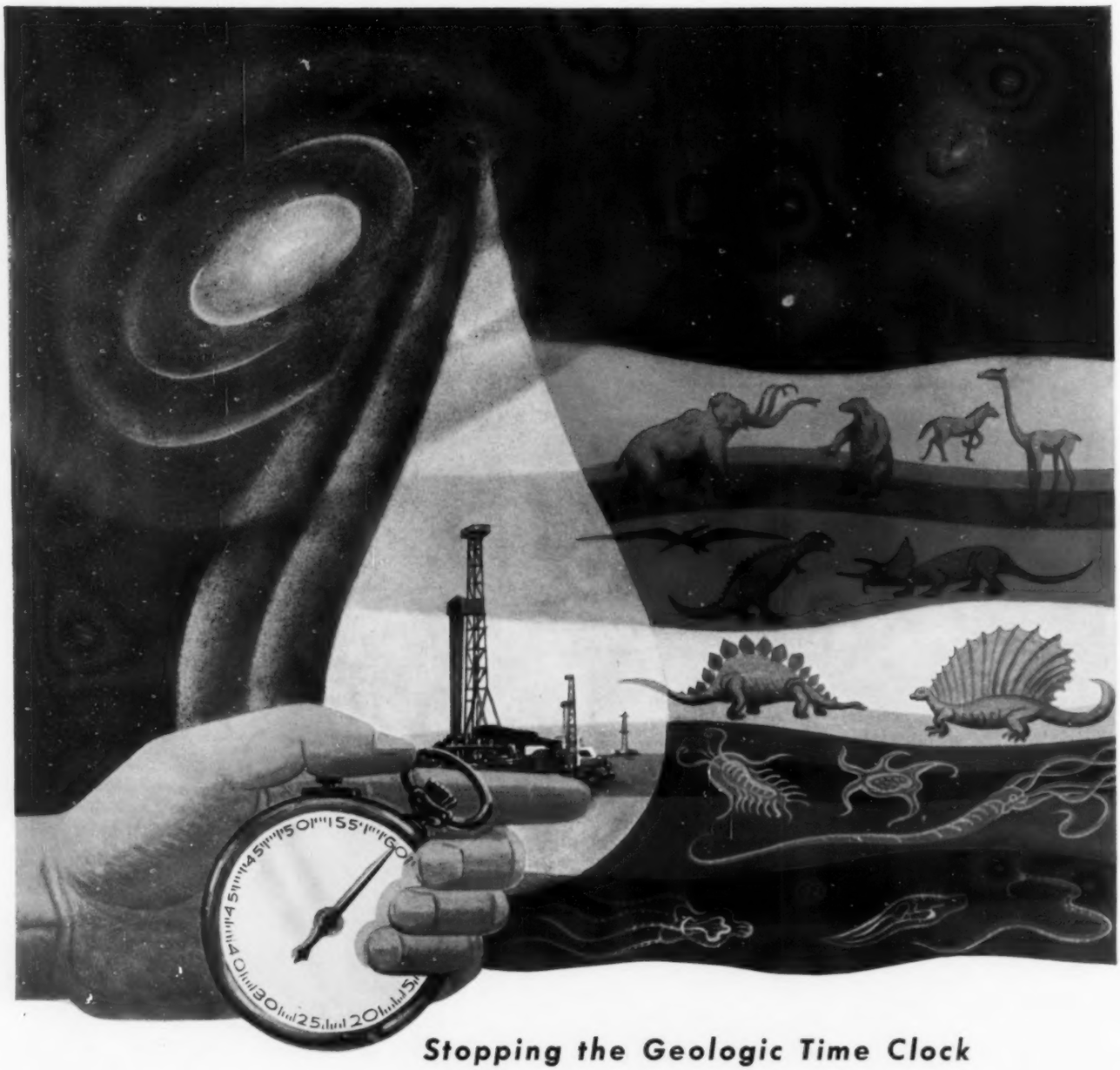


Stopping the Geologic Time Clock

Each year the "crop" of oil is harvested, with no man-made technique for reseeding the depleted formations. Reserves must be maintained against the unabated demands, and man must continue to search and find the precious fluid in ever-increasing quantities to maintain civilization at its present high level.

We at Halliburton aid this search and protection of the very "fluid life" of our civilization through ever better means of producing aids and techniques. Stopping the geologic time clock causes man to probe deeper and further, both into the earth and toward the infinity of space.

HALLIBURTON OIL WELL CEMENTING COMPANY

DUNCAN, OKLAHOMA

Better Inventory Control Needed

OIL refining is a tonnage industry except for a few specialties. The selling price today of principal refined products ranges from less than one cent per pound to not much more than two cents per pound in cargo lots at US Gulf Coast refineries. Crude oil at the well costs more than the selling price of bunker "C" fuel oil after transportation from well to refinery and manufacturing to specification.

It is because refined oils are mass-produced with a low labor content per pound of finished goods that the industry has been able to supply the world's energy requirements at very low prices. Oil has not followed the general upward trend of the worldwide inflationary spiral, because of technological advances in refineries. Individual units have been enlarged, and throughput has been increased through bottleneck removal. Output of finished products per man-hour has been increased by these means, as well as by automation.

In an industry such as oil refining, costs are lowest when throughput is at "capacity"—or maybe a little above rated capacity. It is this fact which gets the industry into trouble from time to time. To avoid oversimplification, it should be stated that this is not the only reason the industry gets into trouble. Often the imbalance in demand for individual products contributes substantially. For example, this may be an imbalance brought on by extremely cold weather and a high demand for domestic fuel oil, forcing refiners to produce more motor fuel than the market will absorb. There is always a seasonal factor to be reckoned with.

Temporary emergencies and usual seasonal swings generally are handled without too much distress because the refiner is able to manipulate his yield pattern to a considerable extent. But the urge to reduce unit costs through full-scale operations is more likely to cause difficulties in a recession period such as that through which the United States now is passing. Tendency is to keep runs near maximum until inventories have passed the economic danger point. When that happens, many managers in the industry try to unload by cutting prices.

Price cuts are a proper means of reducing inventories unless everyone—or nearly everyone—in the industry is similarly burdened. Price cuts by one company when others have normal supplies do not usually break a market; effect of such cuts is transitory. But when everyone has more gasoline, more fuel oil, or more lubes than he can comfortably carry, the price mechanism does not work. In some industries, lower prices may stimulate demand—but not in oil. What manufacturing plant will increase operations because of a drop in the price of fuel? What home will be heated to 75 degrees instead of 70 because the price of distillate has been cut? What car owner will drive an extra mile or so because gasoline is cheaper? There may be isolated instances, but they are few and far between.

In some industries, management has adopted an accounting device which tends to correct the urge of the manufacturing department to run at capacity in order to keep costs low.

Here is how it works: The manufacturing department is required to earn a return on its investment. Otherwise it cannot come to management for money for expansion, etc. But the manufacturing department is charged with investment in finished products in storage as well as in plant and equipment. Raw materials are charged in at cost. Labor costs are added, plus the usual charges for depreciation, amortization, overhead, and the like. Inventories are valued on the basis of these costs. What happens, then, is that the manufacturing department does not reduce its costs by producing more goods than the sales department is able to deliver to customers. Throughput costs may be less, but storage charges, losses through evaporation, and interest on investment must be added to manufacturing costs.

As always, the sales department must prepare its budget for the guidance of manufacturing. But, when demand falls and inventories rise, the manufacturing department immediately demands a revised budget and cuts runs to the point where optimum inventories are realized.

Whatever the mechanism, it is obvious the oil industry needs some means by which inventories are not built up on a "we hope so" basis, but are rigidly regulated to the necessities of near-term demand. Such controls have not been exercised in the past or the industry would not be disturbed as it is today by weak markets. In most cases, crude-oil inventories can be controlled by production departments in the same manner. There are certain contractual requirements which always must be met; but, as a whole, the industry will win in the long run by close supervision of crude stocks as well as those of finished goods.

World tanker fleet rises 12½%

Shipbuilders still have 332 tankers on the ways despite some cancellations due to current oversupply. Major oil companies continue building program in anticipation of future increases in oil demand.

by Alan L. Paget

To review the state of the world's tanker fleet intelligently at the present time, it is fleet intelligently at the present time, it is not sufficient merely to record the number and tonnage of vessels, freight rates, etc. It must be faced at the outset that world politics have influenced the situation in a manner previously unparalleled in peacetime, as evidenced by the aftermath of the Suez incident and the violent fluctuation in tanker freight rates which has followed. From the fantastic single-voyage rate of £19 ($53) per ton for the carriage of oil from the Persian Gulf to the United Kingdom, via the Suez Canal, paid in December 1956, to the beggarly rate of around 15s. 6d. ($2.15) reached in January this year, no logical appraisal is possible except by reviewing the trend of events during the past 12 months.

The slump in single-voyage tanker freight rates is mainly attributable to the surfeit of tankers. In the second half of last year the record total of 118 tankers was launched, according to estimates made by Davies & Newman, the London tanker brokers. During the whole of 1957, 204 tankers went down the slipways, of which 99 were of 30,000 dwt. Allowing for scrapping, losses, etc., the world's tanker fleet (vessels of 500 tons gross and over) increased by 5.7 million tons last year—no less than 12½%—to almost 51 million dwt.

This compares with a prewar figure of 16 million tons. Since oil consumption and the usual seasonal rise in shipment to the United States East Coast have been disappointing, it is not surprising that nearly 3½ million tons of tankers have been idle for more than four weeks. This total includes some 2 million tons of vessels laid up. The total fleet has rather more than doubled since the war; and, as shown in Table I, its distribution by flag has changed considerably.

According to *Lloyd's Register of Shipbuilding Returns*, 332 oil tankers are now under construction in the world, constituting 49% of all the shipping being built. The total number building or on order is put by Davies & Newman at 1,018 vessels with an

TABLE I
WORLD TANKER FLEET

	May 1948		January 1957		January 1958	
	000 dwt	% of total	000 dwt	% of total	000 dwt	% of total
FLAG:						
British	5,438	23.3	8,517	19.0	9,250	18.2
Norwegian	2,370	10.1	7,067	15.5	7,790	15.3
Liberian	(a)	—	6,324	14.0	9,111	17.9
USA	9,638	41.3	6,175 (b)	13.6	6,083 (b)	11.9
Panamanian	1,532	6.5	3,446	7.6	3,521	6.9
French	659	3.8	2,036	4.5	2,266	4.4
Italian	649	2.8	1,992	4.4	2,183	4.3
Netherlands	601	2.6	1,671	3.7	1,797	3.5
Swedish	520	2.2	1,641	3.6	1,845	3.6
Japanese	(a)	(a)	1,184	2.6	1,440	2.8
Others	1,945	8.4	5,200	11.5	5,704	11.2
	23,352	100.0	45,253	100.0	50,990	100.0

(a) Included under "other."
(b) Excluding US government tonnage.

The USNS "Maumee," high-speed naval tanker built by Sun Shipbuilding & Drydock Co. as the first of the MSTS's in the long-range ship-construction program: Length is 620 ft; beam, 83½ ft; capacity, 180,000 bbl; cruising speed, 18 knots.

aggregate deadweight tonnage of over 34 million—a reduction of nearly 3 million dwt since last July. Only Japan has shown any increase in orders during the past six months, due to a substantial contract by a United States company awarded to its Japanese associate. Japanese shipyards now hold 17% of all tanker orders outstanding, followed by Britain with 15%; Sweden, 13½%; Germany, 13%; and the United States, with 11%.

As already indicated, the disruption of the tanker market and the wide fluctuations in single-voyage rates, of course, were directly due to the nationalization and subsequent blocking of the Suez Canal. By the end of 1956, these rates were 3½ times as high as in the previous February and March. But the accompanying chart (Fig. 1) suggests that the growth of the demand for oil was sending rates upwards well before the crisis.

At first, the freight markets were rather slow to respond to the dangers implicit in nationalization of the canal, but gathered momentum during August—single-voyage rates rising to a postwar peak with the blocking of the canal in November. Arrangements for coordination and redeployment of tanker fleets eased the shortage of tonnage; and, by this policy of massive improvization, a serious breakdown in Western Europe's oil supplies was averted. Nevertheless, a great impetus was naturally given to the expansion of tanker fleets; efforts were made to accelerate completion of vessels under construction, while an unprecedented volume of orders was placed—many of them for vessels of the largest size. Thus, during 1956, the world tanker fleet increased by 8%—from 41,808,400 dwt to 45,253,300 dwt—of which postwar tonnage accounted for 63%.

As a result of this urgent call for more ships, the world's shipyards at the beginning of the year had an all-time record of nearly 30 million dwt of tankers under construction and on order: equivalent to over two-thirds of the aggregate world tanker tonnage currently in service. Of these contracts, nearly 80% were accounted for by tankers of upwards of 24,000 dwt including over 10 million dwt of vessels ranging from 40,000 to more than 100,000 tons each. This trend towards ever-bigger oil carriers stemmed directly from events in the Middle East. Larger vessels mean lower capital cost per dwt of capacity, as well as lower operating cost per ton-mile of cargo carried. For instance, the basic price of a 32,000-ton crude carrier works out at about £70 a ton, while that of a 60,000-ton vessel will be just under £60 a ton—a saving of almost 15%.

One method of relieving the western world's dependence on the Suez Canal could be by competitive transportation around the cape, and this demands crude

STS "Zenatia," 38,000 dwt vessel built for the Shell tanker fleet by Cammell Laird & Co. (Shipbuilders and Engineers) Ltd. (Shell photo).

carriers in the 80,000 to 85,000 dwt range if the ton-mile costs are to break even with those of a 40,000-tonner passing fully loaded through the canal. It is interesting to record that, in the spring of last year, Greek interests were reported as having placed inquiries for several tankers of 130,000 to 150,000 dwt. These very large tankers (in the 80,000-ton plus range) do, however, post the question of providing adequate facilities for berthing. Few oil ports in Europe and America can accommodate tankers bigger than 30,000 to 40,000 tons. It is for this reason that, in Britain, the new ports at Finnart on Loch Long, Milford Haven, and Tranmere are now being established. France is also building new oil berths at Le Havre and on the Mediterranean. Other aspects of supertanker operation involve the questions of greater structural strength and more powerful propulsion machinery and, hence, increased costs. This has led to speculation as to the use of atom power. The short answer to this is that one day the atom-powered giant tanker will no doubt become a commercial reality. But that day still lies rather far in the future. Summarizing the situation, it may be said that, if a satisfactory regime for the Suez Canal could be established, tankers in the 45,000- to 65,000-ton range would serve; but, if the cape route has to be used regularly, the trend towards the largest possible tankers will undoubtedly be accelerated.

TABLE II

SPOT TANKER FREIGHT RATES

(Monthly Averages: Scale = 100)

	1955	1956	1957
January	115	165	400
February	135	135	410
March	105	130	295
April	75	170	150
May	70	205	100
June	70	205	80 (provisional)
July	85	180	
August	100	210	
September	95	235	
October	100	255	
November	185	415	
December	245	440	

By the spring of last year, tanker freight rates had begun their journey down from the Suez crisis level. A steep fall occurred in March, largely because the major charterers withdrew from the spot market in anticipation of an early clearance of the canal. A further fall in April brought the rate for the trans-Atlantic run down to about £2.14s. ($7.50) a ton, and there arose the first inklings of an idea that there might soon be too many tankers available to permit the earning of economic rates. By midsummer, the truth of this conjecture was only too obvious; for single-voyage business owners were accepting rates less than one-fifth those obtaining at the peak of the Suez crisis. Table II gives a clear picture of the course of events.

Despite the drastic fall in rates, it became obvious that future prospects were not wholly gloomy in that there was a sharp contrast between the short-term and long-term tanker prospects, which was highlighted by two announcements made by the British Petroleum Co. in July. One reported the decision to lay up nine surplus tankers—presumably the least economic to operate; the other revealed that orders had lately been placed with British yards for 26 tankers totaling 1,150,000 dwt, including seven of 65,000 tons and nine of 50,000 tons. The total cost exceeds £80 million, and delivery will be made between 1960 and 1963. Thus, notwithstanding its present surplus, the company envisages a large increase in its requirements over the next few years.

According to Davies & Newman, 86 tankers were launched in the first six months of 1957—half of them being over 30,000 dwt. Thus, despite those vessels which were converted to dry cargo or scrapped, the world's commercial tanker fleet increased by no less than 2.4 million dwt in the six months, to a total of 47.7 million.

Estimates by John I. Jacobs & Co. for this period, however, implied that the rate of new ordering had passed its peak. New orders totaled just under 7.75 million tons, compared with some 12 million tons in the second half of 1956. Total contracts on the books for tankers of 5,000 tons and upwards were estimated to comprise 1,028 ships with an aggregate tonnage of 33,817,000—excluding the communist bloc, for which reliable data are lacking. Of this amount, a total of 12½ million tons was for oil companies and over 21 million for independent owners. In terms of carrying capacity, it represents an increase of about 90% on the existing fleet.

By the autumn of last year, it seemed likely that completions for the whole year would total about 5½ million dwt, with a probable rise to 6 million the following year and to, perhaps, 6½ million in 1959, 1960, and 1961. Meanwhile, the average size of tankers continued to grow. Of the 99 vessels completed in the first half of the year,

OIL TANKERS UNDER CONSTRUCTION IN THE WORLD, DECEMBER 1957

	Steam		Motor		Total	
Country of Build	No.	Tons Gross	No.	Tons Gross	No.	Tons Gross
Great Britain & N. Ireland	43	815,586	32	232,822	75	1,048,408
Other Commonwealth	—	—	1	6,000	1	6,000
Argentina	—	—	1	1,600	1	1,600
Belgium	4	63,000	2	24,500	6	87,500
Denmark	—	—	6	92,100	6	92,100
Finland	—	—	6	19,980	6	19,980
France	8	172,180	5	68,425	13	240,605
Germany	10	194,000	30	65,924	40	259,924
Italy	23	509,362	7	71,900	30	581,262
Japan	32	782,350	13	86,691	45	869,041
Netherlands	9	156,800	13	135,307	22	292,107
Norway	3	50,140	15	162,979	18	213,119
Peru	—	—	1	4,297	1	4,297
Portugal	—	—	4	23,570	4	23,570
Spain	1	22,000	12	122,610	13	144,610
Sweden	3	61,500	22	345,295	25	406,795
United States of America	24	577,403	1	1,740	25	579,143
Yugoslavia	—	—	1	13,500	1	13,500
WORLD TOTAL	160	3,404,321	172	1,479,240	332	4,883,561

Source: *Lloyd's Register*

An artist's impression of the new type supertanker being built for BP Tanker Co., shipping organization of British Petroleum Co. Ships from 42,000 to 65,000 dwt will be of similar design—the most noticeable features of which are the streamlined superstructure, masts, and funnels (BP photo).

52 were of 24,000 tons or more, and included 16 vessels of over 40,000 tons. Moreover, of the 1,028 vessels reckoned to be on order, no less than 207 were of 45,000 tons or more as compared with 150 at the beginning of the year. While several builders indicated their ability to discuss contracts for vessels up to 120,000 to 130,000 tons, it is thought that, for the time being, owners will probably be content with capacities—and then only in very limited numbers—around 100,000 tons. The main considerations are: the need for more operating experience with such enormous vessels, the doubtful wisdom of locking up so much capital in a single unit, the restricted choice both of charterers and route, and the lower operating economies with progressively increasing tonnage.

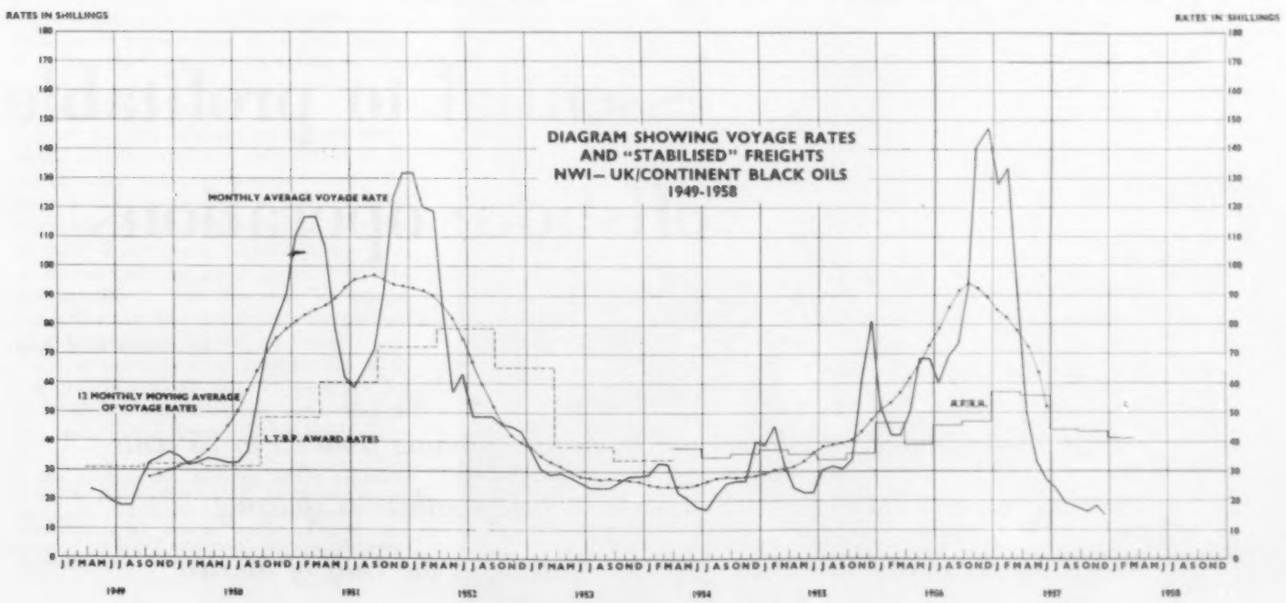
As regards methods of propulsion, it is of interest that six general-purpose tankers —each of 18,000 tons—originally planned by one of the oil companies as turbine vessels, have been changed to motorships using

(*Continued on page 80*)

TABLE III

WORLD TANKER FLEET OF 2,000 DWT AND OVER
AS OF DECEMBER 31, 1957

FLAG	No.	Total Dwt	%	FLAG	No.	Total Dwt	%
Liberian	343	8,406,525	16.96	Turkish	9	101,337	.20
British	566	8,363,357	16.88	Polish	6	56,246	.11
USA	487	7,870,198	15.88	Israeli	4	53,488	.11
Norwegian	429	7,317,929	14.76	Chinese	3	52,628	.11
Panamanian	180	3,392,539	6.84	Saudi Arabian	1	46,550	.09
French	126	2,190,816	4.42	Chilean	4	44,300	.09
Italian	133	2,053,927	4.14	Uruguayan	3	35,580	.07
Dutch	119	1,594,206	3.22	Yugoslav	3	34,710	.07
Swedish	89	1,498,084	3.02	Peruvian	6	27,186	.05
Japanese	74	1,308,076	2.64	Egyptian	2	25,400	.05
Danish	54	949,830	1.96	S. African	1	24,575	.05
Russian	79	739,216	1.49	Indian	2	23,460	.05
German	37	537,577	1.08	Australian	1	17,700	.04
Argentine	47	441,504	.89	Korean	4	16,788	.03
Spanish	37	382,629	.77	Icelandic	1	16,730	.03
Canadian	47	288,101	.58	Costa Rican	1	12,012	.02
Greek	20	280,001	.56	Siamese	3	11,159	.02
Finnish	17	244,430	.49	Pakistan	1	9,760	.02
Brazilian	16	229,800	.46	Colombian	2	7,380	.01
Venezuelan	29	199,809	.40	Irish	1	3,350	.01
Honduran	9	197,425	.40	New Zealand	1	3,325	.01
Mexican	18	175,297	.35	Dominican	1	3,156	.01
Belgian	9	164,271	.33	Cuban	1	2,043	.01
Portuguese	9	107,932	.22		3,035	49,582,337	


RATES IN SHILLINGS
DIAGRAM SHOWING VOYAGE RATES
AND "STABILISED" FREIGHTS
NWI— UK/CONTINENT BLACK OILS
1949-1958
MONTHLY AVERAGE VOYAGE RATE
12 MONTHLY MOVING AVERAGE OF VOYAGE RATES
L.T.B.P. AWARD RATES
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This patented trenching machine of Collins Construction Co., of Port Lavaca, Texas, is used in lowering submarine pipeline below the ocean floor. After the line has been laid, the machine travels along the pipe—excavating a trench underneath, allowing the line to settle gently. The trencher consists of a framework of welded piping fitted with a series of jet nozzles through which is injected water and air. This sets up a swirling action which cuts the material and carries it up and away. Two sets of rubber rollers fit around the pipeline to hold and guide the trencher. The two buoyancy tanks shown keep the unit upright in the water.

Deck view of the Collins trenching barge, showing the unique trenching machine on the stern. Three Allis-Chalmers 3-stage centrifugal pumps, powered by twin General Motors 6-110 diesel engines, are manifolded to furnish 6,000 gal of water per minute at 500 psi to the trenching machine. Two 600 CF rotary air compressors furnish air pressure. In a single pass over the pipe, the trenching machine is capable of cutting a trench from 12 in. deep in running sand to 3½ ft to 4 ft in clay. This machine has successfully operated in water up to 110 ft, having lowered a 24-in. line 35 ft below the bottom at that depth.

Pipeline gathering systems essential to profitable offshore operations

by James W. Calvert

High cost of gathering offshore oil by barge—running from 25 to 75 cents per barrel, and subject to interruption by bad weather—is spurring the construction of submarine pipeline systems in the Gulf of Mexico.

An observer standing on the Atachafalaya River highway bridge at Morgan City, La., on one of any number of days this past winter, would have seen a sorry procession creeping into port from the petroleum-rich but storm-tossed Gulf of Mexico:

Battered supply vessels, their steel bulwarks hammered and crushed—crew boats crusted with salt spray with their seasick and injured human cargoes—seagoing oil barges, pipeline lay barges, giant mobile drilling rigs seeking shelter from the relentless pounding of the sea in one of the worst winters within the recollection of even the oldest natives of the Gulf Coast region.

This Geophysical Year may have been a boon to the scientists who are seeking to learn the mysteries of the earth and the atmosphere above it; but it has been unkind to the oil and gas prospectors of the Gulf of Mexico.

Ever since Hurricane Audrey took its toll of life and property in the coastal town of Cameron last fall, there has been one period of bad weather after another.

Seagoing oil men will never give up, but transportation remains their No. 1 problem.

It is bad enough that tons upon tons of supplies and equipment must be hauled, the "hard way," to drilling wells at sea. It is estimated that an average oil well, during a 30-day period, requires 50 tons of diesel fuel, 2,000 tons of fresh water, 100 tons of pipe, 300 tons of drilling mud and chemicals, 170 tons of cement, not to speak of miscellaneous supplies ranging from over-size bottles of aspirin and sacks of food, to walnut shells and chicken feathers, dry ice, fog horns, pile drivers, and drilling bits.

It is bad enough that drilling crews may lose a full day recovering from seasickness after a 30- to 70-mile voyage in a plunging, rolling crew boat to a drilling platform. Eventually the well is completed and put in production. There remains, then, the interminable, costly, and back-breaking task of bringing that production to market—a vexing situation which is putting pipeline construction in the forefront of projects essential for the economic development of America's only remaining petroleum frontier, the Gulf of Mexico.

Since the first offshore wells were completed in 1947, approximately 200 miles of under-water pipeline have been laid—almost half of it during the year of 1957. Plans are in prospect for another 100 miles or more of pipeline to be built in this year of 1958—an amount which seems infinitesimal considering the thousands of square miles of ocean floor which form the pattern of the submerged oil and gas fields.

Projects already announced for the coming year include 24 miles of 4-in. line by Kerr-McGee Industries Inc., connecting its gas wells in the Breton Sound production; an extensive 24-in. offshore gathering system of Transcontinental Gas Pipeline Corp.; nine miles of 6-in. line across Lake Pontchartrain to connect Shell Oil Co.'s Block 41 gas field with its refinery at Norco, La., capable of delivering 15 million cubic feet of gas per day, and an undetermined amount of pipe linking producing wells in the Gulf with central production platforms.

Only when pipelines can tap the rich oil and gas reserves under the turbulent waters of the Gulf, oil men say, will the offshore fields become profitable ventures. This has been proved in rare instances, such as California Co.'s Marchand field already served by pipeline collection and now operating "in the black."

Two very important gas-gathering systems claimed the limelight before bad weather drove the pipeliners inshore. Working against time, Brown & Root Inc. built in little more than two months a gathering system connecting Chevron field, off the Texas coast, with Standard Oil Co.'s new condensate plant on Padre Island, paralleling an oil gathering system built three years ago. This new system is 5½ miles in length and connects five offshore platforms with the plant, which has a capacity of handling 45 million cubic feet of gas per day—running casinghead as well as dry natural gas. The field is offshore from Kleberg County, Texas, and covers about 5,000 acres with a total of 10 wells drilled from the five platforms since the discovery well was completed in 1954.

They were not so fortunate with the 60-mile marine section of the Kinder-CATC pipeline, connecting CATC (Continental, Atlantic, Tidewater, Cities Service) and Magnolia-Continental-Newmont producing wells off Cameron Parish with Tennessee Gas Transmission Co.'s compressor station at Kinder, La. Originally scheduled for completion in early December, they first ran into permit delays and then bad weather, even though they were building line at the record speed of 2,500 ft per day. The line is now scheduled for completion in late spring.

This system will consist of 107 miles of 26-, 20-, 16-, and 12-in. line capable of delivering about 1.7 trillion cubic feet of gas reserves to the American market. From Kinder, the offshore gas will enter a 540-mile pipeline, which Tennessee Gas built in 1954, to the company's compressor station at Portland, Tenn., approximately mid-point of the main line system which extends from South Texas to northern New England.

New construction methods and specialized equipment have overcome, to a great extent, some of the problems which are unique to under-water pipeline work—problems having to do with corrosion, marine life, and reverse buoyancy. Pipe must be wrapped in fiber glass and concrete, the joints carefully welded into place at sea, X-rayed, and dropped overboard in such a fashion as not to crack the protective coating.

For the CATC-Kinder job, Brown & Root designed, built, and outfitted lay barge M-211, which is 300 ft long, 60 ft wide, and 19 ft deep. One feature of this barge is a special "stringer," a cradle with controlled buoyancy, 356 ft long and attached to the end of the barge, which allows the concrete-coated pipe to be lowered to the floor of the ocean at a gentle curve.

Two other lay barges, the M-140 and the Sample No. 2, also worked on the CATC-Kinder project, laying smaller-diameter sections of the line. Far at sea, the pipeline crews lived on vessels anchored near the work. The M-211 was engaged in laying the larger line nearest shore, and the crew was quartered on a large quarter boat anchored in protected waters near Grand Chenier.

Nearing completion is Brown & Root's new deep-sea pipe-laying barge which is

Brown & Root Inc. laybarge, M-211, especially built for the construction of the 60-mile marine section of the Kinder-CATC gas-gathering line. Concrete-covered pipe is welded, X-rayed, and dropped overboard in a gentle slope as the barge moves forward.

350 ft long, 60 ft in width, and 22 ft deep, which will be capable of laying both concrete-coated pipe and the pipeline coated with the new Timcoat process which utilizes asphalt and barite compound rather than concrete for achieving reverse buoyancy. Equipped with an 80-ton crane with a 120-ft boom, the barge can be used for pile driving, building offshore structures and other miscellaneous heavy-duty work, as well as pipe laying. Airconditioned quarters will house a crew of 88 men, while storage facilities will provide a six-day supply of pipe if weather conditions prevent supply barges from delivering pipe to the barge at sea.

Another lay barge of unusual design—completed a year ago and successfully operated in the open gulf—is the "Magic," designed and built by Marine Gathering Co., of Houston, a subsidiary of Commonwealth Oil Co.

The vessel is 269 ft x 50 ft x 13.5 ft; contains airconditioned quarters for a crew of 46 men; and its principal feature is a long ramp which leads from the superstructure at the forward end to deck level at the stern. On this ramp are mounted five stations, the first of which is 40 ft from the top of the ramp. As a 40-ft joint of pipe is hoisted to the ramp from a supply barge alongside, it is first welded with a "stringer head"; the "hot pass" is completed at the second work station; filler and cap welds added at the third; the joint X-rayed at the fourth; and wrapped with anti-corrosion material and filled with concrete at the fifth. Each process requires about 8 min, and at the end of each cycle the barge is "kedged" forward on anchors which are constantly moved out by tugs.

Controls are operated from a bridge at the forward end of the barge so that the operator can take up or slack off on the anchor chains as the operation requires. Living quarters, galley, laundry, and other housing facilities are located in the superstructure below the bridge. Beneath the ramp are shops, tool rooms, diesel-driven generators, X-ray developing rooms, and storage facilities. The barge can lay as much as 2,000 pipe of large diameter in a 24-hour period, and can operate as far as 50 miles at sea.

Corrosion is one of the more serious problems of pipeline construction offshore, and one method of fighting this scourge of the sea is to trench, or lower, the pipeline after it has been laid on the ocean floor. One of the most successful operators in this specialized field is Collins Construction Co., of Port Lavaca, Texas, utilizing a method its engineers first devised a few years ago when they undertook the task of lowering Transcontinental Gas Pipe Line Corp.'s line under the Hudson River to New York.

Pipeliner Sammy Collins and his engineers constructed a framework with air and water jets which would buckle onto the pipeline. By dragging the frame back and forth along the pipeline the jets would cut a trench into which the pipe would sink to the required depth.

This operation has become standard practice in the construction of offshore pipelines. Burying pipeline in the ocean floor protects it from marine growth which ordinarily would shorten the life of the line, and thus greatly reduces normal maintenance requirements. Collins Construction Co. is presently completing a trenching project near Grand Isle, La., and has started another such job in the vicinity of Cameron, La.

Except for the major pipeline projects, most of the construction work during the coming year will be concentrated on building short feeder lines, from producing wells to production platforms in the vicinity. This will permit a more efficient collection of production by barge to the pipeline terminals ashore.

One of the principal drawbacks of offshore production is the limited facilities on the well platforms. Most structures can support only about 500-bbl tanks. Many wells pump directly into barges anchored permanently to mooring buoys, with flexible lines running from the well head along the ocean floor. There the collection barges are either picked up by tug, which brings an empty barge to the well location, or a transportation barge is lashed alongside and the crude oil pumped out of the permanently moored collection barge.

The most serious problem of this method of collection is the weather; eight-foot seas (and they are not unusual in the Gulf of Mexico, especially during winter months) make it impossible to bring a vessel alongside either a drilling structure or a moored barge. If bad weather continues for a protracted period, it is necessary to shut down the flowing well when the storage capacity has been reached—thus facing the peril of "sanding up" of the well.

The practice of erecting production platforms in the center of an offshore field, with feeder lines running from the wells, will enable the storage of 5,000 bbl or more. One such installation is the platform recently erected by Phillips which has storage facilities for approximately 18,000 bbl. The unit consists of two platforms—one containing generator equipment, compressors, loading crane, living quarters for the production crew, and a helicopter landing; and the second, larger, platform containing three cylindrical storage tanks.

Flow of oil from the three producing platforms served by the structure is electrically controlled. The two platforms of the production unit are connected by a catwalk, but are still far enough apart to be separated in case of fire or other emergency.

Oil companies estimate it costs an average of 40 cents per barrel to barge crude oil from offshore locations to pipeline terminals. This ranges from a cost of 25 cents per barrel from locations close to the shore, to as much as 75 cents per barrel or more from locations far at sea.

Seagoing barges, approved by American Bureau of Shipping and the U.S. Coast Guard, are required for this operation. One operator, who has a fleet of 13,000-bbl barges in collection service, estimates that his annual maintenance cost is $10,000 per barge. Equipment subjected to this rugged duty has a life expectancy of only a few years.

Corrosion control for the big offshore structures requires the attention of special engineering departments. The under-water portions of the structures are protected by cathodic systems—mainly consisting of galvanic anodes, either zinc or magnesium, which are changed every 18 months to two years. Because corrosion is most severe in the so-called "splash zone," or from 5 ft to 7 ft below and above the water line, this area is usually wrapped with a monel sheathing welded to the platform legs and bracing. This material costs an average of $5 per square foot; and a small eight-pile tender-type structure will require about 1,200 square feet of space to be covered with this monel wrapping.

Superstructures, or portions of the structure above any wetted surface, can be protected by paint systems, and it is customary to apply a five-coat vinyl mastic paint over a white sand-blasted surface.

Repairs are made to these structures periodically. There is a certain amount of structure damage after each drilling operation; and the platforms must be cleaned, repaired, and painted after each drilling crew moves off. Thereafter the structures must be cleaned and repainted every two years. Most oil companies maintain regular painting crews for that purpose only.

Probably the greatest peril to the structures themselves is the surging of the seas and the occasional blows of barges and heavy vessels moored alongside. A well platform for drilling in 75 ft of water will require piling of 500 ft in length. An eight-foot sea will exert a pressure of some 600 tons, and this constant surging so weakens the structure that it must be constantly maintained, reinforced, and repaired.

Marine engineers are constantly seeking new and improved methods of protecting structures—and vessels—against damage, and to safeguard the crews from the perils of transferring from small boats to fixed platforms at sea. This is a problem as old as men who have gone to sea in ships. The peril to the seagoing oil man is even greater than that of the pilot or seaman who boards a ship from a small boat, because the ship can be maneuvered to "form a lee," and in really rough weather the larger vessel can drift oil to leeward to calm the turbulent seas. No such aids are available to the driller or roughneck who attempts to board a drilling structure from a tossing crew boat. The fixed platform offers no such protection as does a ship, while the sea is especially turbulent around the legs of a drilling structure.

Variously, the companies have tried overhead lifts, high lines, and other devices from transferring personnel without having to go alongside; but no device has yet been invented which will eliminate this danger.

At the present time, Shell Oil Co. is experimenting with an "artificial whale,"

made of rubber, which engineers hope will offer more protection to crew and supply boats and the men who ride them.

Captain E. R. Vorenkamp, marine superintendent for Shell, recalled his seagoing days when he delivered fuel to a whaling factory ship in the arctic. His tanker would lay alongside the whaling ship while the tanks were being cleaned to receive cargo of whale oil, and they would moor to the whaler with a dead whale as a fender. He said the two vessels would roll easily, without damage, with the whale compressing and extending with the surge of the sea.

Recalling this experience, he interested a rubber company in designing an "artificial whale" 20 ft long and 3 ft in diameter which would serve as a more efficient fender between the drilling platform and the rolling crew boat.

The project is still in the experimental stage, but Captain Vorenkamp feels it may be the answer to a very serious transportation problem. Another safety "experiment" is the use of a chain ladder encased in rubber in such a manner that it will provide some elasticity to reduce the relative movement between the tossing boat and the platform.

Normal development of the offshore drilling operation—with fields gradually working outward into deeper water—might have seen a more orderly transition of the type of specialized vessels required for the oil industry.

"Under these normal circumstances," said one oil-company executive, "it might have been years before we reached out 50 to 70 miles to drill offshore. But because of the boundary dispute between the states and the federal government over the ownership of the tideland oil fields, we are finding it necessary to go beyond the limits of our existing marine equipment.

"A year or so ago we thought that 65-ft crew boats would be adequate. Now we can't consider anything less than a seagoing vessel of 85 ft or longer. The crew boats we built a couple of years ago are already obsolete, so far as our present requirements are concerned."

According to H. E. Denzler Jr., marine maintenance supervisor for The California Co., the petroleum industry "is naturally interested in the development of mineral resources and not, particularly, in the designing of vessels"; but he feels there are many ways in which offshore transportation could be improved.

"We have only a few requirements," he said, "dependability and safety; speed; ruggedness; cargo capacity; personnel capacity; versatility; economy."

A big order for shipbuilders to fill!

While surface craft will never be entirely displaced for the transportation of drilling crews to offshore locations, the use of helicopters is becoming more widespread, and today most of the crew transfers—in good weather—are made by the "choppers."

One reason for the expanded use of helicopters has been the ability of the manufacturers to keep apace of the peculiar requirements of the modern-day oil industry.

"The first helicopters we used were so limited in their scope," said one oil-company official, "that a 10-place 'chopper,' going out on a 75-mile trip, could carry only four men and their gear. Today the helicopters have been improved to such an extent that we can make a complete crew change with a minimum of flying time."

While expensive to buy and to operate, the helicopters offer many advantages over the slower, and perhaps less costly, methods of surface transportation. Drilling crews are paid on a "portal to portal" basis; and, with travel time reduced on an average of 85% to 90 %, it means a considerable saving in payroll.

Seasickness is a costly experience for the oil companies, and frequently crews who have been buffeted by an 8- to 12-hour ride in a crew boat will be unable to work for a full day after their arrival at the rig. Crews transported by helicopter are ready to go to work immediately after a short flight to the platform.

Cost comparison studies between surface and helicopter transportation have disclosed a monthly saving of as much as $10,000 by use of the big transport "choppers." It is estimated that 25 or more oil companies use helicopters either on a continuous or intermittent basis, and that fully 100 contractors and independent oil men use helicopters on an occasional rental basis.

Industry leaders complain of the high cost and low return of the offshore oil fields, but all agree that its development is indispensable.

Ira H. Cram, senior vice president of Continental Oil Co., testifying recently before a congressional subcommittee gathering facts relating to legal problems in the tidelands area, declared that the oil industry has never plowed so much money into a given area with so little to show in proved reserves and revenues.

He declared that offshore oil efforts have cost the industry approximately $2 billion with a gross return to date of only about $400 million, and he compared the offshore experiences to that of the postwar development of the Alberta, Canada, areas.

"At the end of 1956 the industry had also spent about $2 billion in Alberta in exploration and development during the nine years since the discovery at Leduc," said Mr. Cram. "During that period the industry in Alberta produced almost four times as much oil as the offshore industry, and at the end of the period had a daily production over three times as great, three times the crude proven reserves, and more than 3.5 times the natural-gas reserves."

But, at the same time, he added that "the offshore appears to be today the most promising area for the discovery of major fields of crude oil and natural gas at ordinary or unusual depths."

So, with all its drawbacks and problems of transportation, bad weather, and the ever-present threat of hurricanes, the Gulf of Mexico appears to be one of America's "last frontiers. END

Workmen aboard the laybarge M-211 fill the welded connection with concrete as the last of five steps in the submarine pipeline construction.

This is how submarine pipeline looks as it goes over the side. 40-ft joints of pipe have been wrapped in concrete to give reverse buoyancy. Without the heavily weighted material, the pipeline would float.

The "Howard S. Cole, Jr.," self-propelled drilling tender built by New York Shipbuilding Corp. for Coastal-Marine Drilling & Construction Corp.: The tender is fully equipped with diesel-electric generators, mud and cementing equipment. Complete living quarters are provided for a crew of 58.

The future of Suez

Egypt's new Suez Canal Authority has begun 27-month improvement program designed to widen and deepen the canal for transit of 27-ft-draft vessels.

by Engineer Mahmoud Younes

THE Suez Canal was nationalized on July 26, 1956; and the operation, maintenance, and improvement of this vital waterway became the responsibility of the Suez Canal Authority, an Egyptian organization formed specifically for this purpose.

The problems we encountered during the months immediately following nationalization, with many of the employees and pilots of the former company, are too well-known to bear repetition here.

However, I should like to call attention briefly to the situation with which we were confronted when the British and French pilots left their jobs in September 1956. Of a total force of 187 trained men, we were left with only 26. It was the devotion and dedication of these men which carried us through this relatively short trying period during which a special course of training was organized on a technically studied basis —permitting us, after a few weeks, to form a new contingent of pilots recruited from among the personnel of the Egyptian navy. This nucleus of new pilots was progressively reinforced by a number of mariners who flowed in from all parts of the world.

The Suez Canal Authority now employs 220 pilots of 16 different nationalities, as compared to 187 men under the former company.

Things were returning to normal when the ultimate interruption to our plans took place. Egypt was invaded in October—resulting in the widespread destruction or paralysis of the larger part of our equipment, workshops, and other vital installations. The canal itself was blocked completely. Faced with this disastrous situation, we appealed to the United Nations for cooperation in the clearance of the canal—which began immediately with the withdrawal of the last invading forces from our territory. The job was completed in record time, and navigation was resumed, April 10, 1957. I must here pay special tribute to the loyal and frank cooperation of the United Nations in the clearance of the canal and the effort displayed by all technicians who contributed to this end under General Wheeler's tactful and competent authority.

Engineer Mahmoud Younes, Chairman, Suez Canal Authority

Once the canal had been cleared, we had to face the problem of insuring regularity of service in spite of the small means left to us. Workshops had to be set up again and put in working order; damaged equipment replaced, or at least repaired; spare parts obtained—all of which were occupations demanding immediate attention. And we could not afford the least waste of time. In July 1957 we were able to secure a new suction dredger, similar in size and capacity to the largest previously employed. A twin sister to this dredger has recently arrived, and is now in service.

When navigation was resumed in the canal, in April 1957, the maximum draft permitted was 24 ft. Since then, every possible effort has been made to increase this draft progressively to 34 ft—which was attained, January 30, 1958. Shortly the draft will be increased to 35 ft.

These efforts have resulted in our being able to handle the record number of vessels which have presented themselves for transit as traffic has steadily increased. On December 21, 1957, and on February 14, 1958, sixty-nine transits were accomplished —the largest number in one day in the history of the canal.

As an example of the evolution of traffic in the canal since its nationalization, the accompanying tables show a record of transiting ships and net tonnage in November 1957, as compared with the same period in 1955, as well as a general comparison of traffic between the two months of October and November 1957.

Improvement Projects: the area of the wet cross-section of the canal, when constructed, was 310 square meters—the depth being 8 m and the width 22 m at the bottom and 52 m at water level, with slopes of 1:2.

From the construction of the canal in 1869 until its nationalization in 1956, eight programs were carried out with a view to improve it—in the years 1876, 1884, 1901, 1908, 1912, 1921, 1948, and 1955.

The eighth program was started in 1955; its main aims were: to increase the canal's wet section from about 1,250 square meters to about 1,500 sq m; to increase the depth of the water in the canal so as to allow the transit of ships drafting up to 36 ft (about 38,000 tons gross); to allow the transit of 50 ships daily, with a maximum of about 75 ships. This program includes the construction of a bypass, 4 km long, at Kabret; and the deepening of some sections of the canal of about 100 km long.

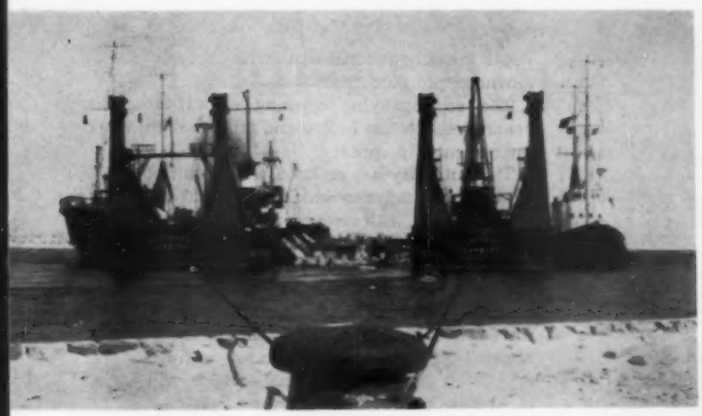
The former company had divided this program into seven sections—three of which were started before the nationalization. Two sections are now completed—the third being under completion. As to the four remaining sections: The canal authority will soon invite bids for them, and they include the excavation, by dredging, of about 20 million cubic meters of earth.

The authority has noticed, after the nationalization of the Suez Canal, that the former company was carrying out the 8th program taking into account the end of its concession which was approaching. Hence the 8th program, elaborated by the company, had two basic weak points, which were:

1. The revetments were established at the edge of the natural slope of the canal embankments—making it impossible to proceed to a further widening without demolishing these revetments. This suggests that there was no intention to widen the canal in the near future, in order to increase its cross-section up to 1,500 square meters.

2. The revetments were planned after a type which is considered as provisional and the stability of which cannot be guaranteed for a long time—which confirms that the company was keeping in view the approach of the end if its concession.

The authority avoided these two defects in its modified program, by adopting revetments of a more permanent type, built at a sufficient distance from the edges so as to allow a further widening of the canal without touching the revetments. Moreover, these were themselves planned in such a way as to allow their dismantling and reassembling, if a third widening of the canal were to be carried out.



Above: The UN salvage plant lifting the "Akka," wrecked south of Timsah Lake.

Right: The general workshops at Port Fouad, at full work after having been completely repaired.

The *amended 8th program* is a result of the conclusion, by the authority, that the 8th program (as established by the former company) does not meet all the requirements of the traffic in the near future. The authority then decided to bring the following amendments to this program, and effectively started their execution in the four sections which were announced in a general adjudication in the beginning of March 1958. The expected required time for these works is about 27 months.

The most important of these amendments are:

1. The increasing of the wet cross-section of the canal so as to vary between 1,550 square meters and 1,600 square meters, according to regions.

2. The increasing of the side slopes in sections where weak soil occurs, to avoid falls and necessity to reduce speed for transiting vessels, in these sections.

3. The construction of the revetments at a sufficient distance from the natural slope ridge so as to allow a further widening of the wet cross-section in the future, without touching these new revetments.

4. The deepening of the canal, so as to allow the transit of vessels drafting 37 ft (of nearly 46,000 tons gross).

The authority has effectively started the dry excavation works necessary to the widening of the canal scheduled by the 8th amended program. Dry excavations above water level amount to about 5 million cubic meters, the excavation of which has effectively been started through contractors. As for dredging works which will be announced immediately in the general adjudication, they include: the removal of 17,000,000 cubic meters for widening purposes; the removal of 3,000,000 cubic meters for deepening purposes; the demolition and reconstruction of nearly 57 km of side revetments.

This, besides the other deepening works, will be carried out by the authority through its own dredgers, in other sections, to complete everywhere the achievement of the

TABLE I
General Comparison of Canal Traffic
(November 1955-57)

	Nov. 1955	Nov. 1957	% Increase
Number of transits	1,208	1,436	+18.9
	(Thousands of Tons)		
Gross tonnage	12,924	15,843	+22.6
Net tonnage	9,666	11,916	+23.3
Goods tonnage	8,512	11,023	+29.5

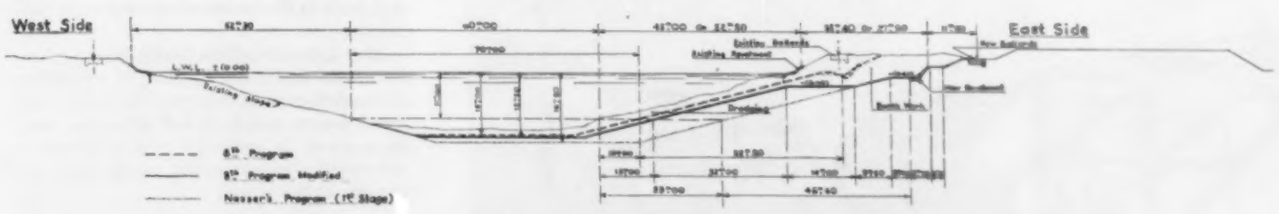
TABLE II
Net Canal Tonnage According to Direction of Transit
(Thousands of Tons)

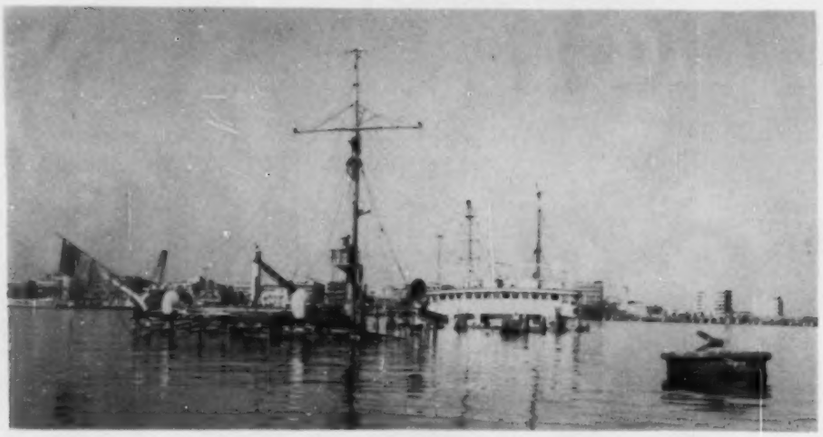
	Nov. 1955	Nov. 1957	Increase
Southbound	4,830	5,708	+ 778
Northbound	4,736	6,208	+1,472
Total	9,666	11,916	+2,250

TABLE III
General Comparison of Canal Traffic
(Daily Averages in October and November 1957)

	Oct. 1957	Nov. 1957	Increase	% Increase
Average number of transits	46.7	47.9	+ 1.2	+2.6
Average gross tonnage:	(Thousands of tons)			
	519	528	+ 9	+1.7
Average net tonnage:	392	397	+ 5	+1.3
Average goods tonnage:	343	367	+24	+7.0

Typical Suez Canal cross-section before and after 8th improvement program (between 25,000 km and 44,500 km).





Dredger "Ramses" (formerly "Paul Solente") wrecked in Port Said harbor and blocking the canal.

The dredger "Ramses" after refloating, undergoing repair on the floating dock at the Port Fouad workshops.

"26th July," one of the two new dredgers acquired by the Suez Canal Authority: These craft are among the most modern and powerful now in service in the world.

depth readings consistent with the 8th amended program.

The accompanying drawing shows the canal cross-section before and after the 8th improvement program.

The authority has realized, as a result of studies and statistics which it carried out, that the canal with its present section—and even with its section after the completion of the 8th program—cannot cope with all the requirements of shipping or with the constant progress in vessels' dimensions. Hence it started, immediately after the nationalization, the preparation of a huge project to improve the canal—which will be known as the "Nasser project."

President Nasser never missed an opportunity to affirm, by himself, Egypt's determination to: keep the canal open for all ships; give transiters the best of service; continuously maintain the canal, so as to keep its required high standard; develop it so that it may constantly cope with the progress of world trade and shipbuilding.

In compliance with his directives, the authority is now carrying out extensive studies to prepare the "Nasser project" to improve the canal further.

The accompanying drawing shows the first stage of this project, which will allow the transit of vessels drafting 40 ft and of about 55,000 tons gross. In its final stage, the scheme aims at: 1. Doubling the canal throughout its length. 2. Deepening it so as to allow the transit of a very high proportion of the largest tankers in the world. 3. Improving piloting methods and using the radar in the pilotage in Suez roads. 4. Using the television as a mean to control and improve navigation and locate vessels in the canal. 5. Fitting out a complete fleet of suitable fully-equipped dredges and floating crafts—allowing a perfect permanent maintenance of the canal. 6. Equipping the authority's workshops in such a way as to cope with its requirements as expected after the progress achieved in its floating plant and appliances. 7. Modernizing the equipment to give the best of service. 8. Improving methods of recovery by increasing the number of towing tugs, and creating between the present bases intermediate points where they will be stationed, so as to allow a quicker help to ships which may go aground in any section of the canal.

With a view to these aims, the authority has already started the establishment of a research station to carry out tests on models of the canal and its approaches. University professors and engineer specialists in these branches will take part in these tests. The authority is also carrying out extensive surveying and geological studies in order to prove the nature of the soil beds in the areas where the canal will be doubled.

May I, finally, affirm that it is our intention to maintain the freedom of navigation through the canal; to attend to its constant development and technical efficiency; and, in a word, to make of this waterway a trustworthy instrument of prosperity to all nations of the world. END

Trans-Arabian pipeline capacity soon to reach 460,000 barrels daily

Installation of unattended intermediate pump stations and enlargement of existing stations has raised line capacity 85,000 b/d. An additional expansion of 25,000 b/d will be in operation by July.

By the end of February, the Trans-Arabian Pipe Line Co. (Tapline) and the Arabian American Oil Co. (Aramco) had completed a long-range $21 million program to increase the capacity of the trans-Arabian pipeline system. This system, which is owned in part by Tapline and in part by Aramco, extends for 1,068 miles from Aramco's oil fields near the Persian Gulf coast of Saudi Arabia to Tapline's offshore loading terminal on the Mediterranean Sea, at Sidon, Lebanon.

This expansion program has increased the capacity of the pipeline system by 25% —to about 435,000 b/d per calendar day from 350,000 b/d. Today this system has the largest capacity of any single long-distance pipeline anywhere in the world.

The Trans-Arabian pipeline system, which is 30 in. and 31 in. in diameter, was originally completed in December 1950, at a cost of approximately $200 million to the two companies involved. Tapline and Aramco are sister corporations. Both are owned 30% by Standard Oil Co. of California, 30% by The Texas Co., 30% by Standard Oil Co. (N.J.) and 10% by Socony Mobil Oil Co.

The new expansion program has involved considerable pioneering of a technological nature. The heart of the program is the use of combustion-gas turbines for the first time for continuous operation on an oil pipeline. Nine of these turbines, rated at 5,000-hp each, have been purchased from International General Electric Co. They drive special high-speed (5,200-rpm) centrifugal pumps built by Byron Jackson Pumps Inc.

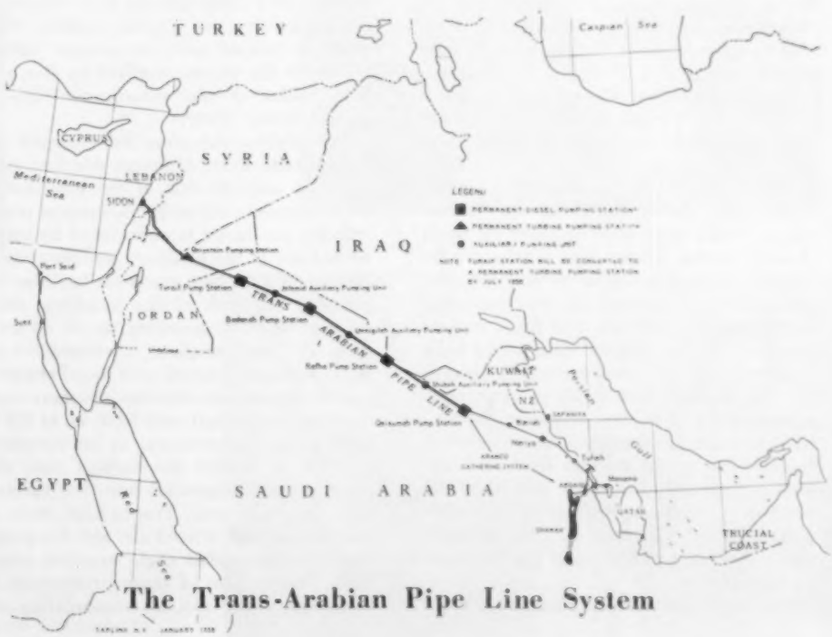
Five of the nine turbines have been installed as auxiliary pumping units at intermediate locations between the existing pump stations, which are approximately 160 miles apart. Three of these are located at Jalamid, Uwaigilah, and Shubah on Tapline's part of the system. The other two are located at Wari'ah and Tufaih on Aramco's section. A sixth auxiliary pumping unit is intended to be used normally as a spare.

The other three turbines have been installed permanently. Two of them are located at Tapline's existing Turaif pump station, and the third at Tapline's existing maintenance base at Qaryatain, Jordan. The Qaryatain unit is the first pumping facility on the pipeline system to be built outside Saudi Arabia.

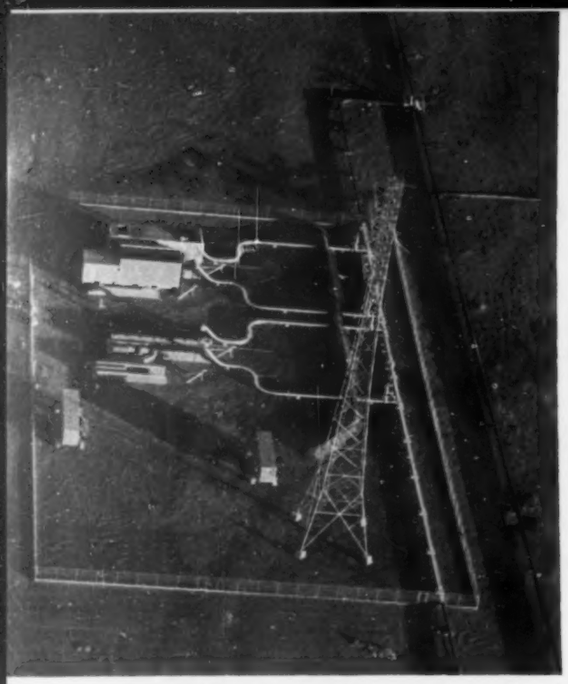
From the very beginning, the pipeline system was constructed in such a way as to accommodate additional pumping facilities at intermediate locations between the existing pump stations. However, the tremendous investment and relatively high operating costs of complete community stations made this type economically unattractive for the intermediate sites. After a careful analysis of various alternatives, the most attractive scheme for increasing throughput capacity appeared to be to install one 5,000-hp unattended pumping unit at each intermediate site.

The design requirement for such an unattended unit posed a considerable challenge. First, the pumping unit should be powered with a single dependable prime mover. Second, the prime mover should be fueled with crude oil taken directly from the pipeline. Third, the pumping unit should be suitable for unattended operation with supervisory control from base stations 50 to 100 miles away. Fourth, the pumping units should be portable to permit rotation and overhaul at a central shop. The only prime mover which would fill these unique requirements was a simple-cycle combustion-gas turbine.

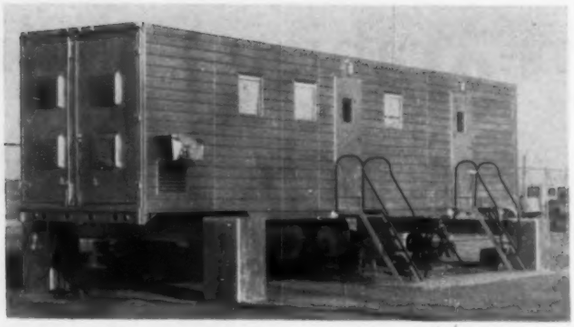
The auxiliary pumping units, costing approximately $1,500,000 each, are outstanding examples of automation. They are unattended and remote-controlled by radio from the existing pump stations. Each of them consists of four portable vans, to-



The Trans-Arabian Pipe Line System



Aerial view of the auxiliary pumping unit at Jalamid, Saudi Arabia: The two large vans at the top of the fenced-in area are the turbine van and, below it, the control van. Located below these two vans are a spare set of concrete foundations and manifolds. The two smaller vans at the bottom are the portable shop van (left) and the radio van (right), alongside the 200-ft-high antenna tower. The main line of Tapline, 30 in. and 31 in. in diameter, runs from top to bottom, at the right.



The portable shop van installed at Tapline's auxiliary pumping unit at Jalamid: It contains a shop and parts storage area.

Left to right are the control van and the turbine van of Tapline's new auxiliary pumping unit at Jalamid. The turbine van is linked by 24-in. pipelines with Tapline's main line.

gether with the necessary concrete foundations, manifolds, and a 200-ft-high radio tower.

One van, containing the turbine and the pump, weighs approximately 125 tons. It is approximately 53 ft long, 15 ft wide, and 18 ft high. A second van, containing air filters and controls, weighs about 84 tons. It has approximately the same dimensions as the turbine unit. The other two vans are lighter and smaller. One of them contains radio equipment and standby power plant. The other contains a small shop and parts storage section.

All the units were completely prefabricated and factory-tested in the United States. Then they were shipped to Saudi Arabia, loaded gently onto outsize truck-trailers, hauled overland to the job site, slid onto their foundations, and connected to the pipeline system. The huge trailers required for the turbine vans would have been too large to travel on most highways in the United States. Their rear tires measured 9½ ft in diameter. Even the turbine destined for Qaryatain was landed at Ras Tanura on the Persian Gulf, and was hauled practically the entire breadth of the Arabian peninsula to its location in Jordan so as to avoid the more difficult, although much shorter, journey over the Lebanese mountains.

The combustion-gas turbines are the ultimate in simplicity so far as moving parts are concerned. Their development was spurred by the development of new materials to resist the extremely high temperatures in jet aircraft engines. The temperatures at the inlet to the turbine nozzles reach 1,450 F. The turbines burn the crude oil carried by the Tapline system. This crude is treated with magnesium sulfate to inhibit the corrosive effect on the turbine blades of the vanadium which is present in the crude.

Each turbine consumes an estimated 430 bbl of crude daily. Although this fuel consumption exceeds that of the comparable diesel engines used at the permanent pump stations, this factor is outweighed by other advantages of the auxiliary pumping units. Having only the bare minimum facilities for pumping oil, each of the auxiliary units supplies as much pumping power as does each of the complete community-type pump stations equipped with diesel engines.

This simple-cycle two-shaft turbine supplies the pump shaft with 5,000 hp at 110 F ambient air temperature, at an elevation of 2,600 ft. Within the turbine van, the pump room is separated from the turbine room by a fire wall. The turbine room is pressurized with filtered air, and the pump rooms is held under slight negative pressure. The purpose of these precautions is to minimize the risk of accumulating oil vapors in the turbine room, where they might be ignited by the hot turbine surfaces. Furthermore, the flow of pressurized air through the turbine room removes excessive heat and keeps out dust.

The auxiliary pumping units are designed for closed suction operation. Suction pressure, discharge pressure, discharge-pressure controller set point (which varies the turbine speed), and filtered air temperature to the turbine are transmitted by radio to the controlling pump station. The units can be started and stopped by radio, and the load can be varied by remote control, by changing the discharge-pressure controller setting.

The radio-control system, in addition, permits the operator at the controlling station to listen to either the turbine room or the pump room. Various safety devices are provided to shut the auxiliary units down automatically in case of excessive vibration, high bearing temperatures, low suction pressure, high discharge pressure, indications of fire, and other similar reasons. When such a shutdown occurs, alarms and lights at the controlling station report the general type of failure. Accordingly, the proper maintenance personnel can be dispatched to correct the trouble.

Both the suction and the discharge valves have piston operators which utilize the man-line oil pressure as the source of

power. These valves close automatically whenever the unit shuts down. This feature minimizes the supply of fuel in case the shutdown was due to some cause which might result in fire.

The radio system is designed for continuous operation. Even if radio contact is lost, however, the pumping facilities will not be shut down. The fail-safe features of the auxiliary unit permit it to operate safely without radio communication. Nonetheless, if it is desired to shut down the auxiliary unit without radio contact, the controlling pump station need only reduce the line pressure. This action will shut down the auxiliary unit due to low suction pressure.

The turbine vans, being completely portable, are to be moved to a special repair shop at Turaif whenever major overhaul is required. During such an overhaul period, the spare portable unit will be installed temporarily to maintain the throughput capacity. Each location is equipped with dual manifolds and foundations to permit the installation of the spare unit and the removal of the operating unit with a minimum loss of throughput.

The first auxiliary pumping unit to be placed in operation was the one at Wari'ah on the Aramco section of the pipeline system. It began operating in January 1957. Two Tapline units, at Qaryatain and Uwaigilah, and one Aramco unit, at Tufaih, were started up in October. The spare auxiliary pumping unit commenced temporary operations in November at Tapline's pump station at Turaif. The last two turbines were permanently installed at Turaif in February 1958.

The use of these new facilities played a large part in enabling Tapline to set a new record for crude-oil deliveries at Sidon during 1957. The average deliveries for the year amounted to 343,373 b/d, as compared with the previous record of 330,745 b/d during 1956. Deliveries at Sidon consist primarily of crude-oil loadings at the offshore tanker terminal there, and secondarily of pipeline deliveries to the adjacent 11,800 b/d modern refinery of Mediterranean Refining Co. (Medreco), owned 50% by Caltex and 50% by Socony.

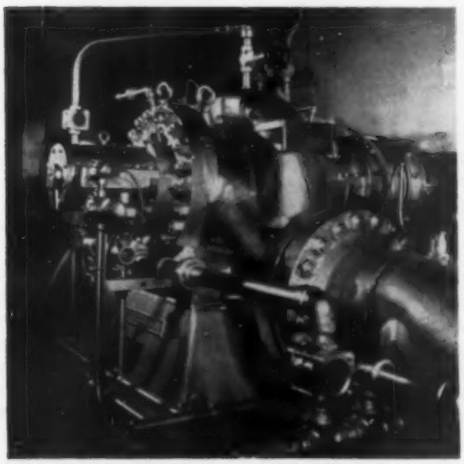
These new pumping facilities, as well as the availability of tankers at Sidon, also enabled Tapline to set a new record for crude-oil deliveries during any one month. The new mark, in October 1957, was 394,367 b/d. These record deliveries were made possible by a record average flow of 366,136 b/d through the pipeline during October, supplemented by withdrawals from terminal storage at Sidon.

Among the tankers loaded during this record month was the "Universe Leader," the world's largest supertanker afloat. This huge vessel loaded the largest amount of crude oil ever taken from the Sidon terminal by a single tanker. It took aboard 601,189 bbl of crude oil at an average loading rate of 32,304 bbl per hour. The tanker also took on 28,502 bbl of bunker fuel. Loading time was 18 hours 35 min.

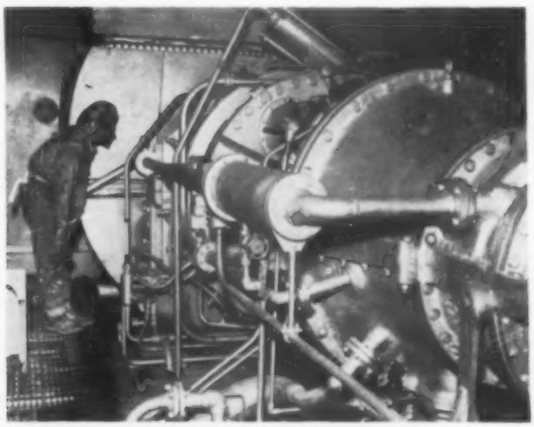
The "Universe Leader" arrived in port at 6:10 am, October 23, and was moored in one of the five offshore berths, one mile from the coast. This was the first occasion this tanker had ever been berthed without tugboat assistance. Actual loading commenced at 11:57 am on that day, and was completed at 6:32 am, October 24. Thereafter the ship sailed for Santos, Brazil. The "Universe Leader" has a tonnage of 85,515 dwt, an overall length of 854 ft 9 in., and a beam of 125 ft 5 in. The power plant is a 21,000-hp steam turbine.

Tapline and Aramco are not resting content, however, with the throughput capacity of 435,000 b/d for the Trans-Arabian pipeline system as of January 1, 1958. Now that the last two combustion-gas turbines have been installed at Turaif, the four 1,700-hp diesel engines which have hitherto supplied the power at that pump station are being parceled out, one each, to four other permanent pump stations. Three of these are being installed at the Tapline pump stations at Badanah, Rafha, and Qaisumah, and the fourth is being added to the Aramco pump station at Nariyah.

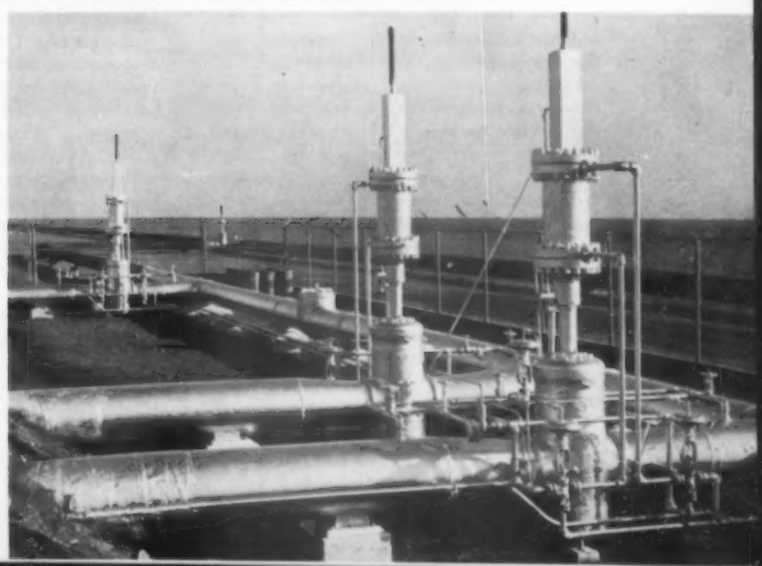
The redistribution of these diesels, ontop of the installation of the turbines, is designed to raise the throughput capacity of the Trans-Arabian pipeline system still further, to 460,000 b/d by July 1958. END



The 5,200-rpm Byron Jackson centrifugal pump installed in one of Tapline's auxiliary pumping units.



The heart of a Tapline auxiliary pumping unit: The 5,000-hp General Electric combustion-gas turbine.



The WKM gate valves on the network of 24-in. pipelines linking Tapline's auxiliary pumping unit at Jalamid: Main line is in the background.

Pipelines continued to show technical advances in '57

REFUTING the argument advanced by some conservative bankers, and also by some engineers unfamiliar with pipelines and their development, the pipeline has not reached its peak, either in expansion or in development of its mechanical processes.

As 1957 was a year marked by continued expansion of North America's vast pipeline network, it was also a year which saw successful application of a number of experimental applications which had been closely watched by the companies originating them, as well as by others which sought to profit by the studies made.

The term "automation" is one which crops up in almost every consideration of pipeline advancement. True automation is not yet found in pipelining, though the development of sequence operations—initiated either by a single control button in a station or one situated in the central dispatcher's office—is frequently incorrectly referred to as automatic operation of pipelines or of individual stations. Design of sequencing equipment has progressed to the point where such units are used for starting and control of internal-combustion engines as well as the more readily governed electric motors. The earlier installation of an internal-combustion engine on the Wolverine line—with start-and-stop functions controlled from many miles away—now finds such setups duplicated on all types of lines, whether crude, products, or natural-gas. These lines do not use any type of drive in which the mere start of flow, the buildup of pressure, within a system automatically sets in train sequences which will enable each station, in turn to assume its share of the work load. But such flow or pressure buildup at any control point does furnish information to the central dispatching office whereby appropriate initiation of operations in the station so reporting is put on—or taken off—the line as conditions warrant.

Prime movers—or, more correctly, power-drives—have increased in size and output as they have been developed to permit automatic sequencing of operations; and the three principal sources of pump or centrifugal drive: the reciprocating internal-combustion engine, the gas turbine, and the electric motors, all have seen marked stepup in power. One gas pipeline utilizes 15,000-hp synchronous electric motors to drive single compressors capable of utilizing such power. Another group of stations on this same system uses gas turbines, with horsepower ratings up to 7,500. And internal-combustion engines—whether fueled by oil, gas or a combination of these fuels—now show horsepower ratings over the 4,000-hp mark. Supercharging of engines, formerly operating on natural aspiration of combustion air, has in some instances stepped up the power output by as much as 40%—allowing greater throughput with little increase in station size of piping.

The gas turbine, considered as an "experimental" drive by many engineers even within very recent times, now is accepted as a drive to be considered where load conditions are favorable, and where other conditions militate against other forms of drive. It can compete economically with other drives on a Btu basis; and, with the continued development of metals and alloys capable of withstanding long runs at high temperatures, requires a minimum of maintenance.

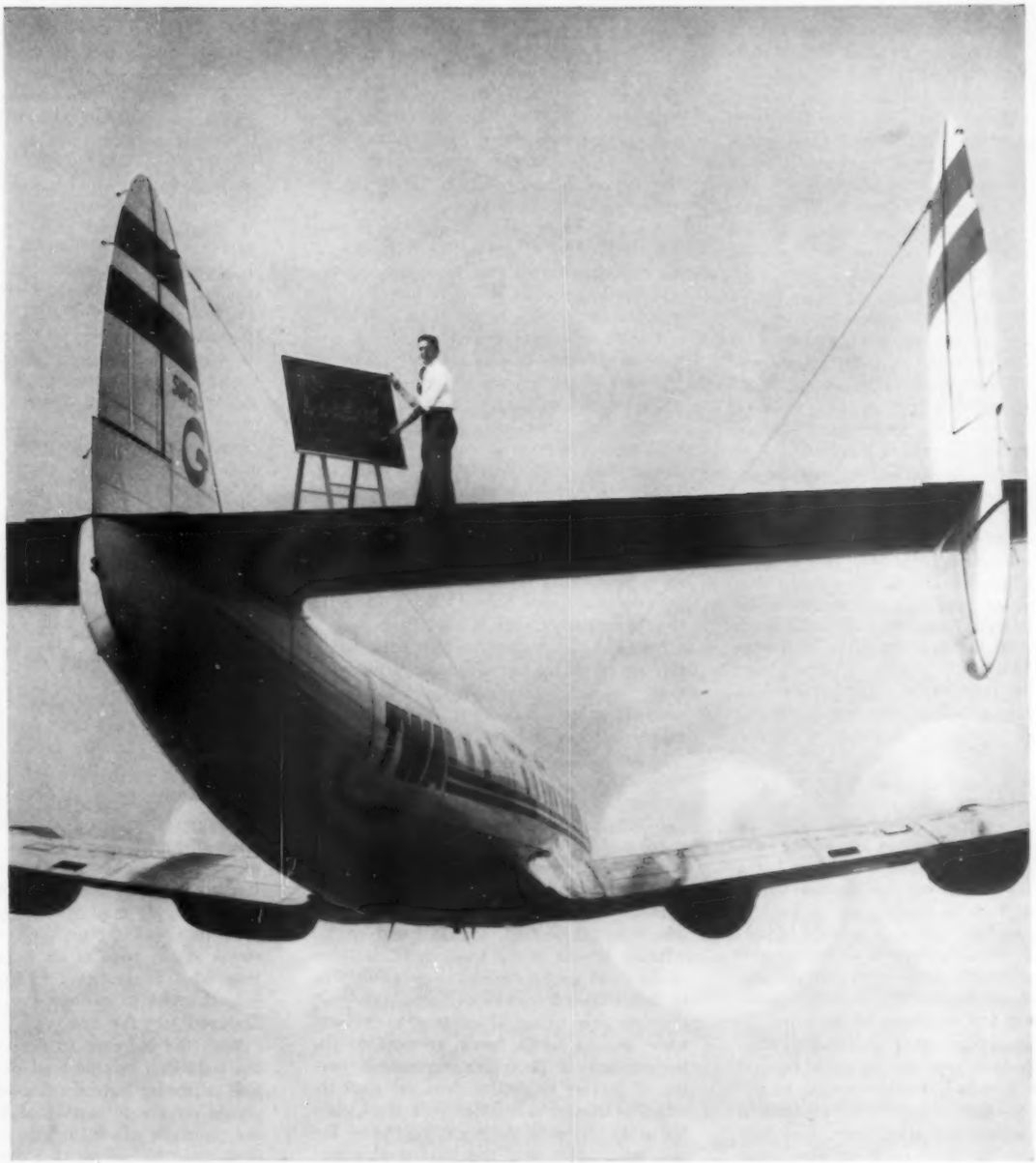
Unlike their prototype in fluid pumping, the gas pipeline's centrifugal compressor or "blower" is a single-stage machine, in most applications. Compression ratios higher than those economically obtained with one-stage compressor are usually secured by coupling two or more such units in series and the desired pressure buildup attained by compounding the ratios obtained. One gas pipeline company—although the unit is still referred to as "experimental"—has in regular operation a compressor with dual rotors or impellers, each operating within its individual casing, but so piped that two impellers may be used as a pair of centrifugals, each taking gas at the station suction pressure and discharging it with similar discharge-pressure readings. This is the system employed when large volumes of gas are to be moved at relatively slight pressure buildup. If, however, demands on the line are such that the gas must be pumped at higher pressures, the unit is so set up with its valves and manifolds that it becomes in effect a two-stage centrifugal—with one side taking gas at station suction, and discharging into the suction side of the second impeller. The unit is unique in that it has but a single barrel, a single shaft, and is so designed that the combination of impellers and suction ducts gives a unit balanced against side thrust. Drive for this dual unit is a 7,500-hp gas turbine, maximum rating, with a power requirement of under 6,500 hp when operating either in parallel or series. The company which cooperated in the development of this experimental unit now has added two similar units in other stations on its system. This type of compressor setup requires less foundation than a plan involving separate units to attain the same pressure increase, with but slight additions to station piping and valving.

Centrifugal compressors, operating characteristics of which demand speeds higher than those attainable with large reciprocating engines, have been generally considered as requiring either synchronous electric-motor or turbine drive to attain economic operating speeds. Within the past two years, the industry has found that the vertical or *V*-type internal-combustion engine—usually gas on a gas pipeline—can be teamed with a speed increaser and highly satisfactory centrifugal compressor operation thus secured. The Westcoast Transmission Co.'s natural-gas line from the Peace River area of northwestern Alberta and northeastern British Columbia, extending 560 miles to the USA-Canadian border near Vancouver, employs this type of drive at all except the initial station. The 3550-hp engines drive single-stage centrifugal compressors through 10:1 speed increasers with the drive employing pinion and gear only, no intermediate stepup. In the stations now on the line, four units in each of two stations, and three in the third—hooked up in series—maintain the desired pressure ratio for the system.

The Westcoast line, operating in country where temperatures as low as —60F are encountered, constructed its buildings for a 40-lb snow load and to withstand a 100-mile-per-hour wind. All equipment designed for outside mounting was subjected to Charpy tests at —60F before being accepted. Wherever possible, equipment was housed—such as the scrubbers and other large units in the sulfur-extraction plant.

The gradual conversion to automatic tank gauging, and its linkage with meters for determining volumes of liquids handled, now finds lease automatic custody transfer and remote gauging being adopted by both crude and products lines. Positive-displacement meters, with capacities up to 10,000 bbl per hour, enable meters to be used in the suction lines of pump stations, and to provide accurate indices of the amount being pumped. Use of meters and LACT reduce the number of working tanks required at a station, as with them it is possible to float one tank on both station suction and field discharge or feed lines. It is no longer necessary to fill one tank, close it off, obtain final gauges, and then put it on suction. Where a station receives several types of crude from the field or fields, one tank for each crude will now suffice, and batching may proceed without regard to the capacity of the individual tank. Field flow may be continued indefinitely into such a system, provided storage capacity of working tank is sufficient to absorb any difference between field flow and station output.

In gas pipelining, where large volumes are handled, the orifice meter is most widely employed, with the P-D meter finding wider application where the transfer of gas



Oilmen <u>should</u> be up in the air. An oil company physicist and his slate of equations may seem out of place in the sky. But airmen couldn't get off the ground without oilmen. Oil helped fly more than 50 million passengers on U. S. air lines last year. Oil research helps new jet passenger planes span the country in less than four hours. Remember these things when you hear misinformed people talk against your industry. Speak up then and there—tell how you help give America wings! **SHELL OIL COMPANY**

is from one company or pipeline to another or distributor. Orifice and pitot-tube units are selected for gas-storage measurement.

The year saw sizable increase in the amount of natural gas in underground storage—with the natural reservoir, such as a depleted oil or gas field, absorbing most of the gas. There were few installations of buried cylindrical containers for gas, as for LPG and other liquid projects. Underground storage of butanes, propanes, and other liquified gases in artifically formed cavities increased—with noteworthy instances being where one company actually mined a system comparing closely to such an operation for the recovery of coal or a mineral. Working through a single vertical shaft to the desired depth—in this instance some 300 ft below the surface—a system of horizontal tunnels and underground rooms was developed—the surrounding material being a dense shale, impervious alike to water and to the liquid to be stored.

Other LPG storage was formed in salt formations, notably in Kansas and Texas, where two methods of removing salt at the desired depth in a salt dome were employed. One—circulating superheated water into the salt and pumping out the resulting brine—formed cavities of size and shape determined by calipering and by volumetric evaluation of the salinity of the brine extracted. The other—again patterned after coal mining—saw the excavation of a shaft and the mining of chambers, some of which rivaled aboveground tanks in area and height.

The unending fight against corrosion of pipe and its companion search for a universal pipe coating, applicable under all conditions and resistant to all coating hazards, saw all three types of coating being specified, as well as the combination where tape serves both as coating and wrap. Use of waxes, asphalt, and coal tar and its derivatives found adherents in all three types of pipeline construction—with conventional equipment serving for the cleaning, priming, coating, and wrapping of the pipe.

Tape wrapping—using either polyvinyl or polyethylene tape averaging a tape of some 10 to 12 mils in thickness, with an adhesive on one side—found wider application under divergent soil conditions. Test sections, in diameters up to 36-in. pipe, have been installed by several companies, and a number of service installations made on both main lines and laterals. Using tape, a single machine can clean the pipe, wrap it, and cradle it for lowering into the ditch. The reduction in size of the gang, as compared with conventional coating and wrapping, reduces the per-foot of application so as to bring the overall cost to a pipeline about that for other types of protection. During the past year, several examples of tape wrapping of pipe 8 in. in diameter and larger were observed in which no outer wrap had been laid on over the tape. In at least one instance, the line was laid in terrain formed from glacial wash, in which gravel and small stones were encountered. No sand cushion or screening of backfill to remove rocks was considered necessary.

Interior coating of pipe with plastic is finding wider application. Mills are now giving pipe a light coating of plastic after being end-cropped and hydraulically tested. This protection afforded the interior of a joint of pipe insures that it will reach the pipeline with essentially the original condition of the interior wall. Reduction of scraper runs necessary to clean the line for service more than defrays the added expense of lining the pipe.

Large-diameter natural gas pipe is being interior-coated with plastics, following the procedure initiated four years ago and first applied to sections of 36-in. pipe in a gas trunk line.

Continued development of offshore oil and gas fields—though somewhat slowed during the latter part of 1957—found offshore pipeline construction proceeding at an accelerated rate. Development of special pipe-laying barges—designed to operate in deeper waters of the Gulf of Mexico, and capable of lowering pipe to depths corresponding to those now being successfully drilled by the latest types of drilling barges—has greatly reduced the damage to pipe as it was being lowered from the end of the welding ramp to its resting place on the floor of the Gulf.

One such device—termed a "stinger," by the spread on the barge—employs two articulated floats—connected by a section of smaller pipe—which form a submersible cradle in which the buoyancy supports the pipe being lowered in a curve which prevents overstressing either pipe or concrete coating.

Adaptation of a means for extruding a coating of an asphalt mix onto a sea-going pipeline—demonstrated two years ago on relatively small-diameter pipe—has been expanded to the point where large-diameter lines can be welded, cleaned, and coated without breaks in the coating. Elimination of the short sections added to cover welding in conventional concrete-coated pipe not only removes areas which tend to concentrate flexure while being lowered to the bottom, but also insures a continuous coating of greater flexibility than the steel itself. The coating is fortified with short glass fibers which, with the toxic quality of the mix itself, overcome the hazard of penetration and subsequent loosening by marine life. The mix is applied with thickness and density sufficient to provide the required negative buoyancy.

Practical size of pipe, either for fluid or gas-carrying lines, seems to be still on the increase. Products lines up to 24-in. in diameter are already in operation. Gas lines, earlier thought to have reached practical tops at 36 in., now find designs contemplating 42-in. pipe; and pipe-fittings manufacturers, of such units as valves and formed ells, tees, and the like, already have produced test units in this last-mentioned diameter. Manufacturers of pipe-laying-equipment have kept abreast of pipe sizes; and ditching machines, side-boom tractors and line-up clamps—to enumerate a few of the many equipment items on a spread—are still able to handle the largest pipe available, working in the conventional manner, i.e., from one side of the ditch.

Contributing toward the success in laying large-diameter lines is the continued improvement in pipe manufacture, which enables thin-walled pipe to be turned out with sufficient rigidity to withstand soil stress while in the ditch, and also to survive transportation hazards without being distorted to the point where its strength is impaired. In at least one instance, a section of this thin-walled pipe had been put into service and had been carrying full working pressures before the contractor was called on to backfill the ditch. Under its design pressure, the pipe was assured of full roundness, and was in no danger of being distorted by the pressure of the backfill—as might have been the case had the line been covered and the surface soil compacted before interior pressure had built up.

With the widespread use of thin-walled pipe in the large diameters, the practice of X-ray inspection of every weld has been extended to include, in some instances, every weld—even on cross-country pipe. When it is considered that one weld in a 42-in.-diameter pipe calls for some 11 ft of joint, it appears that film—or other method of checking the weld for continuity and soundness—is roughly equivalent to checking every fourth joint on a 10-in. line. Elimination of the possible task of excavating for repair of a big, big-inch weld is considered ample ground for the added outlay of checking every weld.

Engineers charged with the design of large-diameter lines tend to avoid the use of isolated weights to overcome the potential buoyancy of the line in the ditch, and are specifying continuous-weight coatings. With thin-walled pipe, the concentration of stress at the edge of an isolated weight—even when applied over a pad of rock shield—is thought to reduce the safety factor designed into the line.

With the increase in pipe diameter and the reduction in pipe-wall thickness, pipeline engineers have demanded greater emphasis on the formation of the bottom of the trench in which the pipe is laid. Special equipment for pulverizing the bedding soil and the elimination of rocks, roots, and other debris which might affect the pipe coating or the continuity of its support—both these means for providing support all along the pipe instead of at isolated areas—are now closely watched by engineers and inspectors. Sandbag cushions atop cribbing are specified on most large lines to avoid possible damage to coating or to pipe wall when the line must be supported for more than a short time. Throughout the process of pipe laying, more and more emphasis has been laid on regarding the pipe as a permanent installation rather than a more or less temporary structure—an idea carried over from the days when a field life was figured in months, instead of years.

END

THE "EVGENIA NIARCHOS"

sister vessel to the highly successful *Spyros Niarchos*, is now in service. On an overall length of 757 feet, she carries 47,000 tons deadweight and has a maximum power of 20,000 S.H.P. Her propeller, like that of the *Spyros Niarchos*, is the largest manufactured in Novoston alloy. It is of Heliston design, five-bladed and weighs 30½ tons.

Photograph by courtesy of the builders, Vickers-Armstrongs (Shipbuilders) Ltd.

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Six principal steps in "Jumboizing" a T-2 tanker:

1 (Left): Shifting the 160-ton midships house from the "Gulfmeadows" to its previously built midbody.

2 (Right): "Gulfmeadows" in drydock ready for cutting apart.

3 (Far right): Refloated bow section is ready for towing away.

New vessels and "Jumboizing"

GULF Oil Corp. is midway in a $114 million expansion program which will about double the capacity of its domestic tanker fleet. By 1960, tonnage of the Gulf fleet flying the US flag will total 770,000 dwt, with a lifting capacity of almost six million barrels.

First of a new series of four Gulf tankers, the "Gulfking" pictured on the front cover of this issue, was launched on July 17 last and delivered on October 25. Since that date, she has been in coastwise dirty service between Gulf Coast and Atlantic ports. A sistership, the "Gulfqueen," was launched on October 2 and delivered December 20 last. Third of the series, "Gulfprince," was delivered on March 14; and the fourth, "Gulfknight," will be launched late this month and delivered in July. Keel of the final vessel in the group was laid on October 14, and building time prior to delivery will be less than 10 months.

Each of the four tankers has a deadweight tonnage of 32,650 and a liquid cargo capacity of 278,000 bbl. Builder is Bethlehem Sparrows Point Shipyard Inc. Construction of a second series of six new tankers is now under way—with deliveries scheduled to begin in June and end during April 1960. The second group of vessels consists of six 29,250 dwt tankers.

Meanwhile, Gulf is modernizing nine of the T-2 tankers by a process known as "Jumboizing"—which consists of cutting off a ship's bow and stern, inserting a new larger cargo section, and putting the tanker back together again. The "Jumboizing" program involves nine T-2's, of which five now are in service. The remaining four will be delivered to Gulf before the end of the year.

"Jumboizing" adds 3,500 dwt to each rebuilt tanker—raising it to slightly over 20,000 dwt. Cargo capacity is enlarged by 25,900 bbl—to 148,000 bbl.

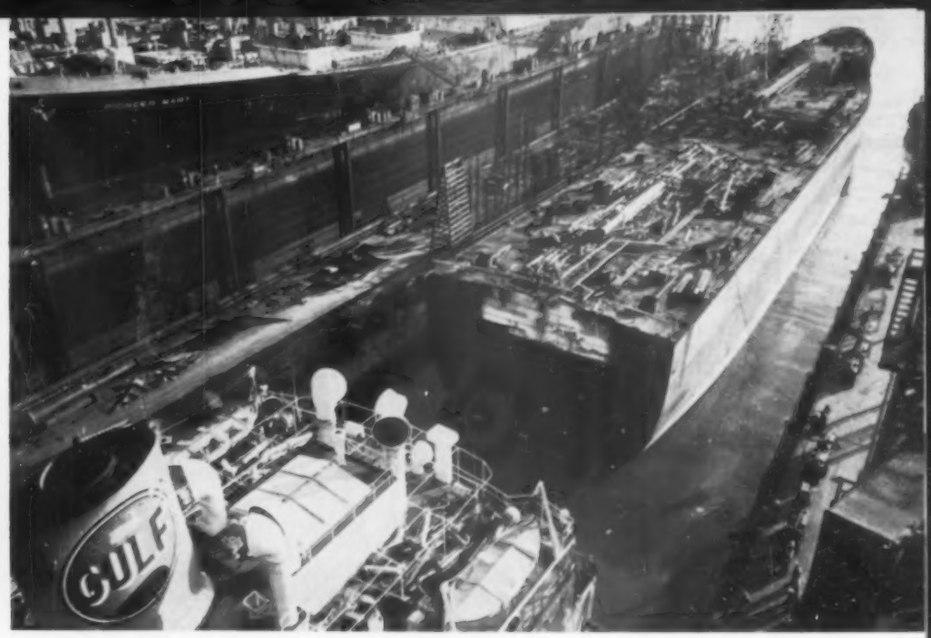
Accompanying photographs illustrate steps in "Jumboizing."

Reconstruction is completed with a minimum layup time, since the center sections are completed before the T-2 is removed from service. Bethlehem Shipbuilding did three of these jobs, and remaining work is being done for Gulf by Maryland Shipbuilding & Drydock Co.

4 (Left): Stern remains in dock ready for new midsection.

5 (Right): While the separated section of the tanker moved away (in the background), the new longer and larger midbody was floated into the stern (Gulf photo).

6 (Far right): Re-assembled tanker now is 48½ ft longer, and has 7-ft wider beam. Cruising speed of the larger vessel is virtually unchanged.



doubling Gulf tanker fleet

When Gulf's present $114 million program is completed, the US flag fleet will consist of 37 vessels—including 10 new tankers, nine enlarged T-2's, twelve T-2's, one T-3, and five others of Gulf's own design.

"Gulfking" and others of the series now being completed are designed to handle a variety of cargo with good segregation of clean and dirty oils. Two product pumps for clean service are located in the forward pump room, and four dirty cargo pumps are aft.

The four aft cargo pumps are horizontal centrifugal single-stage units driven by geared turbines. Each has a capacity of 4,540 gpm, with a discharge of 125 psig. Stripping pumps are vertical double-acting steam units, with a capacity of 700 gpm. Suction and mains are 14 in. OD.

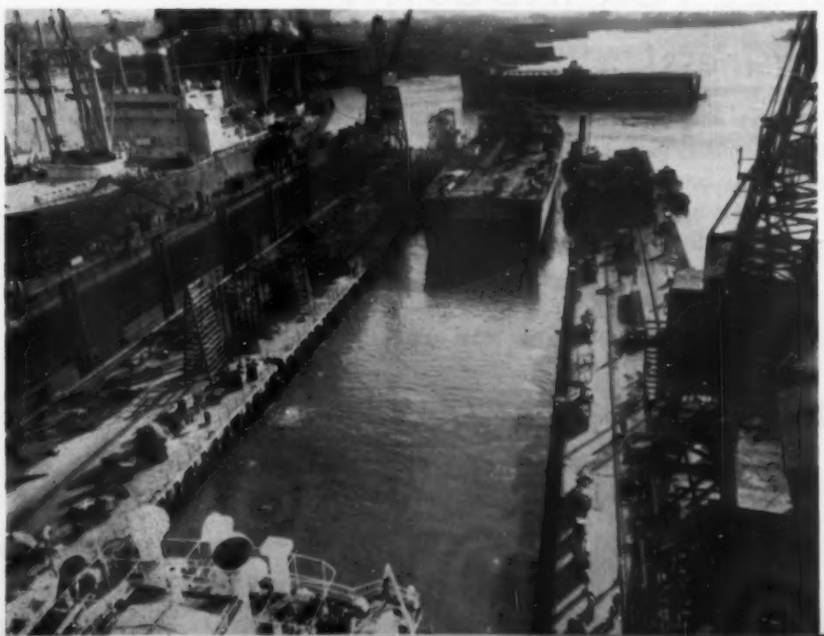
Forward pumps for clean cargo are horizontal rotaries, turbine-driven, with a capacity of 1,400 gpm at 125 psig discharge. Manifolding and pumping is so arranged that up to six different products may be handled simultaneously. Pumping capacity is adequate to discharge a full cargo in 12 hours.

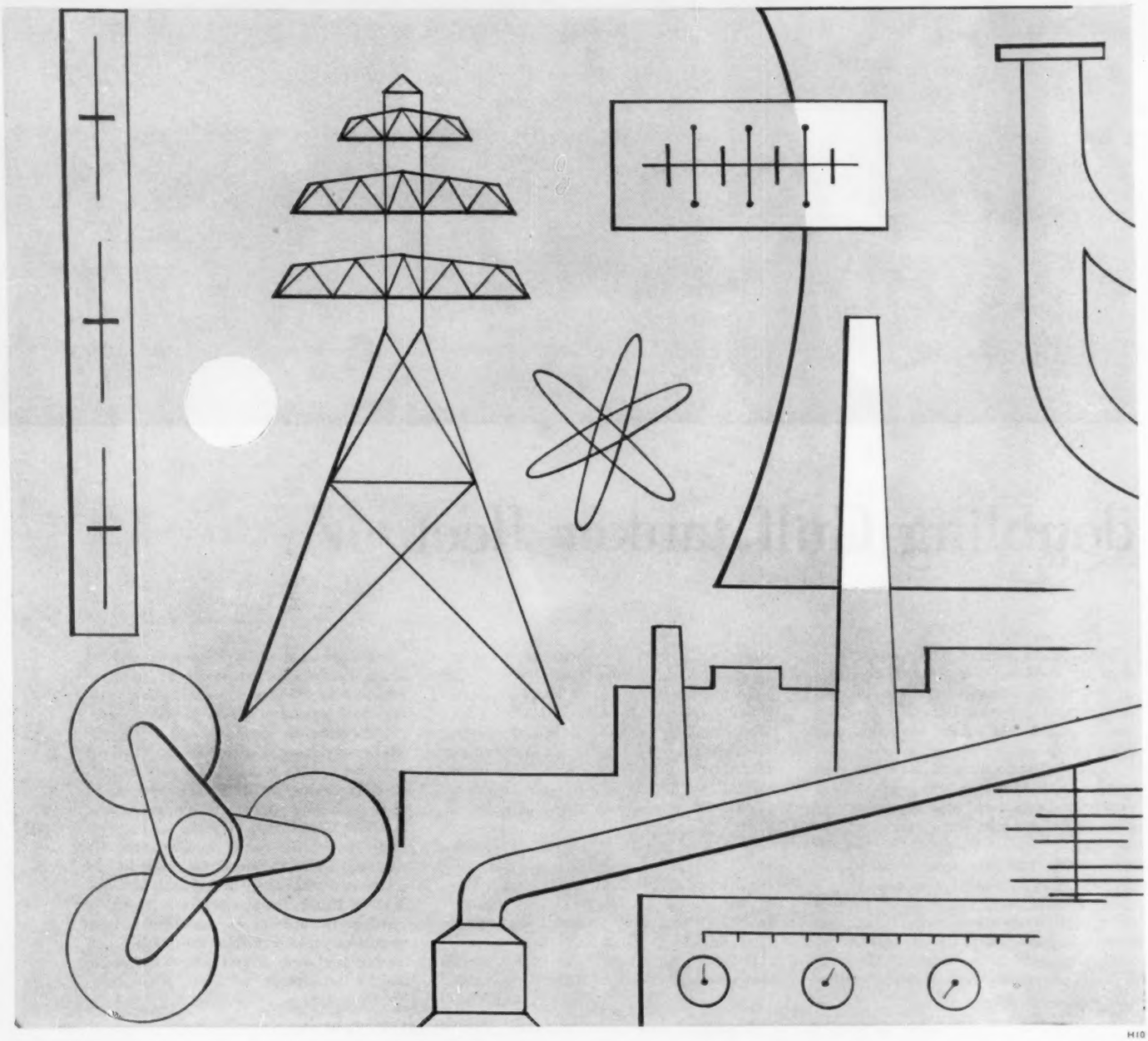
Overall length of "Gulfking" is 661 ft, with 630 ft between perpendiculars. Breadth molded is 90 ft. Draft is 33 ft 11½ in. so that the vessels could pass through the Suez Canal fully loaded if transferred to the Middle East run.

Designed sea speed is 16½ knots. In speed tests over a measured mile, the "Gulfking" made an average speed of 17.61 knots. In the crash stop test, 22 sec were required to bring the propeller from 100 rpm to a stop, and 2 min 56 sec to bring reverse speed to 65 rpm.

The single-screw vessel is propelled by a geared turbine developing a normal shaft horsepower of 13,600 at 97 rpm and a maximum ahead of 15,000 shp at 100 rpm. Steam at boiler superheater outlet is delivered at 600 psig and 850F; at turbine throttle, 585 psig and 840F. Designed fuel rate for all purposes at normal speed is 0.54 lb per shp-hour of 18,500 Btu per lb oil.

Adequate facilities are provided for the recreation and comfort of the officers and men required to operate the "Gulfking" and her sister ships. END





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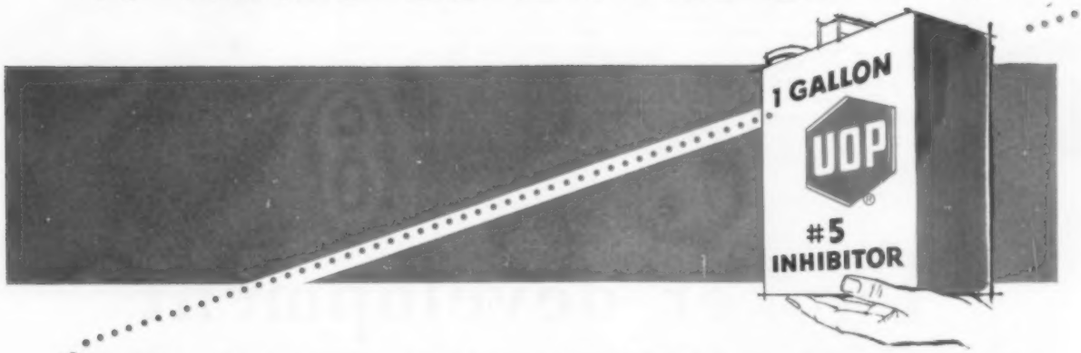

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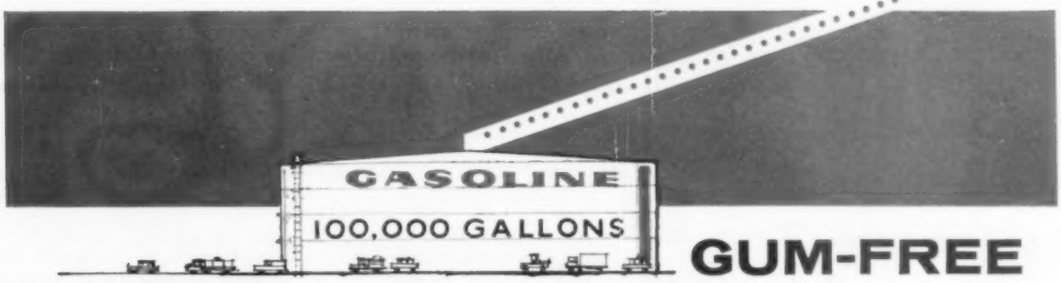

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ALEX LOGAN, OBE, served his engineering apprenticeship with Messrs. Green and Silley Weir Ltd., Blackwall. In 1924 he entered the Royal Mail Steam Packet Co. as a junior engineer, serving in that company's steam and motor vessels.

Mr. Logan joined the "Shell" group in 1927, and after further seagoing service was, in 1936, appointed an assistant engineer superintendent. In 1945 he became engineer in charge of repairs and maintenance of the Shell fleet, and later succeeded John Lamb as manager of the Marine Technical Department. On the formation of Shell Tankers Ltd. in 1953, he was appointed technical director.

Mr. Logan is a vice president and past chairman of council of the Institute of Marine Engineers. He represents this institute on the Technical Committee of *Lloyd's Register of Shipping*, and is a Chamber of Shipping representative on the British Shipbuilding Research Assn.'s Research Board.

Tanker development

by A. Logan, OBE

Postwar development of oil tankers has centered on the design of larger vessels with facilities for quick loading and discharge of uncontaminated cargo, safe operation at sea and in restricted waterways, protection against corrosion, and amenities for the comfort of ship personnel.

THE objective of the tanker owner is to transport oil cargoes at minimum cost, with maximum segregation and efficient means of loading and discharging. The development of the modern tanker has resulted from the endeavors of the designer to achieve these objectives; and, while it would be wrong to suggest that the ultimate has been achieved, there is no doubt that during recent years there have been vast strides in tanker design and in measures to reduce maintenance costs of ships already in service. Not only have vessels become bigger, but propulsion machinery, cargo pump capacity, etc., are vastly different from the 12,000 deadweight tonner of the immediate postwar years.

Oil tankers, other than specialized ships such as bitumen and liquid-gas carriers, can basically be divided into two groups; (1) those engaged in the crude-oil service, and (2) those carrying refined products. Crude carriers in a short space of time have rapidly increased in size from 28,000 tons to 38,000, 45,000, 65,000 tons and larger. For these ships with loaded drafts up to 43 ft and 44 ft, it has become necessary to develop terminals having adequate depth of water and facilities for maneuvering and mooring. Today's product carriers are of about 16,000 to 18,000 tons deadweight with drafts of 29 ft 0 in. or 30 ft 0 in. These ships carry multiple grades principally from refineries to consumer ports.

There are, however, considerable differences between a tanker designed to carry refined products and one which is wholly engaged in the transportation of crude—any similarity between the two being confined only to the general layout and profile of the ship. In this respect, however, probably the most noticeable difference between the modern tanker and the 12,000-tonners referred to above is the position and number of cargo pump rooms. The tankers of the prewar and early postwar era usually had two pump rooms, one forward and one abaft the midship house. These have now almost universally been replaced by one pump room situated aft and utilized as a cofferdam between the engine room and the main cargo tanks—which, apart from giving more space in the cargo tank length, allows the cargo pump driving units to be situated in the main engine room. The two-pump room type of arrangement did, however, serve a very useful purpose as, by the very nature of their construction, they formed a most effective barrier between different grades of cargo when bulkhead leakage was quite a frequent occurrence. The rapid development of welded construction, together with improved design and shipyard facilities, has practically eliminated the bogy of intertank leakage, enabling more grades to be carried without the need to fall back on pump-room separation.

The advantages to be obtained from all-welded construction, however, are not only confined to a more efficient means of cargo segregation, as a completely flush-welded hull shows considerable saving in power for propulsion and increased deadweight when compared to the riveted ship of comparative size.

In addition to the problems associated with the handling of the ever-increasing size of crude carrier, comes the additional problem of discharging cargo within what is accepted as a reasonable time; and, to help speed up this operation in addition to the large-capacity pumps for discharging the oil, a separate large-capacity clean ballast system is frequently incorporated. With this system, sufficient cubic capacity must be available within the cargo tank section to allow certain tanks to be allocated for clean-water ballast only; and, as the pumps and piping handling this ballast are totally independent of the cargo-handling equipment, the ship can be loading crude oil at the same time the ballast water is being discharged. Similarly, while discharging cargo, the ballast tanks can be filled. The amount of clean ballast obviously varies depending on the design and size of the ship; but, in the case of a 65,000 dwt tanker, about 14,000 tons of clean ballast capacity can be made available.

In addition to improving the operational efficiency of the ship, the scantlings of the deck and bottom shell and, hence, the steel weight of the ship can be considerably reduced by placing these clean ballast tanks at, or near, midships. These spaces are, therefore, empty in the loaded condition and, hence, considerably reduce the sagging moment upon which the scantlings of the main hull members are based. The arrangement of the midship ballast tanks, as shown in the sketch (Fig. 1) of the 65,000-ton tanker has been designed on this basis—the additional clean ballast tanks forward being chosen purely for trim purposes.

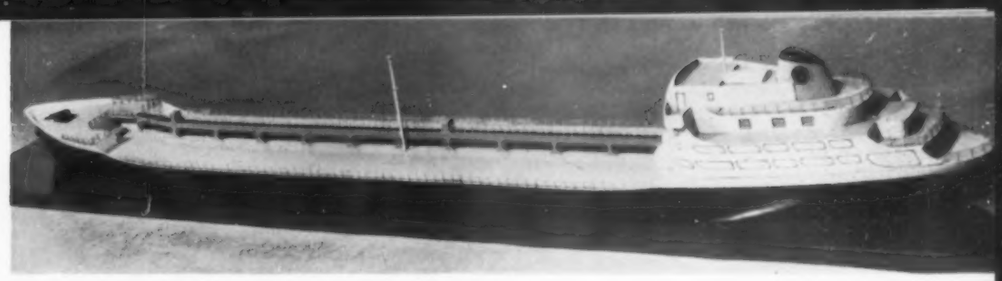


Fig. 2 Model of tanker with the midship deckhouse moved aft and combined with the poop deckhouse.

Left: Britain's largest tanker, flagship of the Shell tanker fleet, the 38,000 dwt "ZAPHON" at sea: She was designed to pass fully loaded through the Suez Canal when deepened to 36 ft.

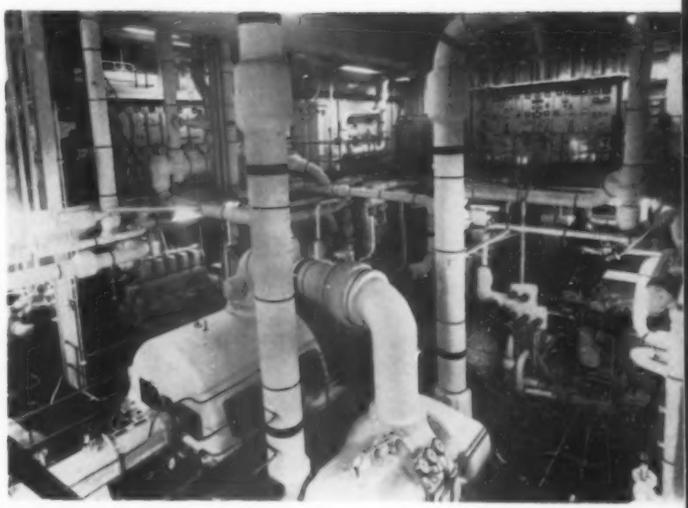


Fig. 3 Engine room of the "ZAPHON," equipped with fluorescent lighting.

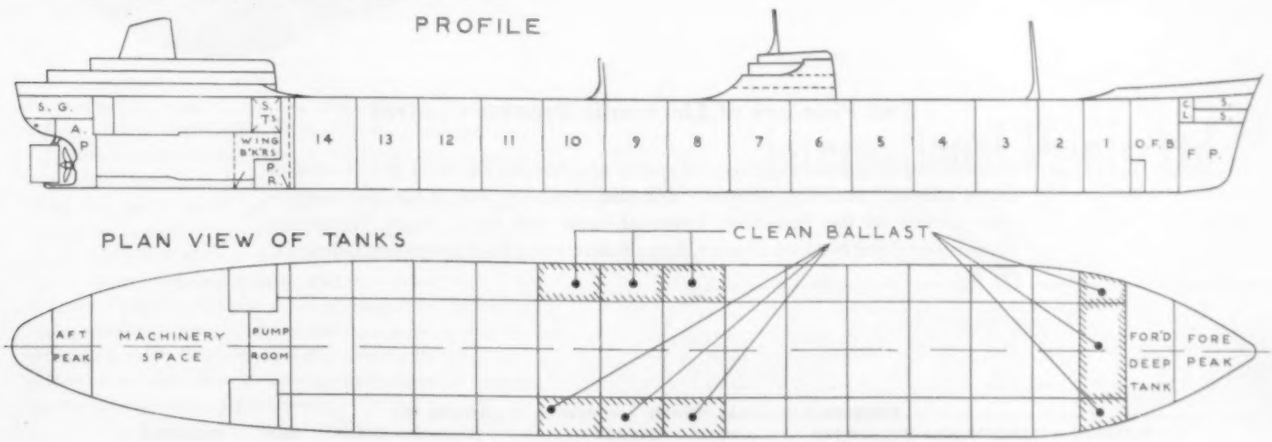
With increase of ship size, particularly the draft dimension, it has been necessary to determine from model experiments the behavior when a ship passes through restricted waterways such as canals, rivers, and channels. It was already known that loaded ships having conventional underwater dimensions "settled" deeper on entry to and during transit through canals and the like. The more near equal the cross-sectional underwater area of the ship to the cross-sectional area of the waterway, the greater would be the degree of settling or "squat"—which was the title under which our experiments were conducted. In addition to the "settling" problem, the steering qualities also had to be studied before designs for the bigger ships could be finalized.

Whilst in the case of a crude ship the cubic capacity necessary for clean ballast is obtained due to the high specific gravity of the crude oil, usually about 0.82 and above, the multi-grade ship is often required to carry refined products having a specific gravity as low as 0.72, which means that much more cubic capacity is required for an equivalent weight of refined product compared to crude oil. In addition, the multi-grade ship may carry up to eight or nine different grades of products part discharging in various ports. This added complication, in addition to the lightness of the cargo, usually rules out any possibility of installing a clean ballast system.

Perhaps one of the most recent changes to the "look" of some of the modern tankers has been the complete removal of the midship deckhouse, with the poop deckhouses increased in size to incorporate all the living quarters and amenities usually housed amidships. This appears to be a logical development with obvious advantages to be gained due to the centralization of the air-conditioning, fresh- and salt-water services, etc., required within the accommodation. Maintenance is also probably reduced. However, a very controversial point about the arrangement of aft accommodation is the question of whether the ship can be navigated and handled, particularly in a fog, from this aft conning position as safely as it can from amidships. Several ships up to about 38,000 dwt have now been in service for some time with this type of arrangement, and no difficulty seems to have been experienced so far. Whether this means that ships up to 65,000 dwt and above will follow this example, however, still remains an open question.

The economical necessity to keep time spent in port to a minimum has led to the development of high-power centrifugal-type pumps for discharging cargo. In a present design for a series of 65,000 dwt ships, four such pumps—each driven by a 1,000-bhp steam turbine—are fitted. In the

Fig. 1 65,000 dwt tanker: length between perpendiculars, 775 ft 0 in.; breadth, molded, 110 ft 0 in.; depth, molded, 57 ft 9 in.



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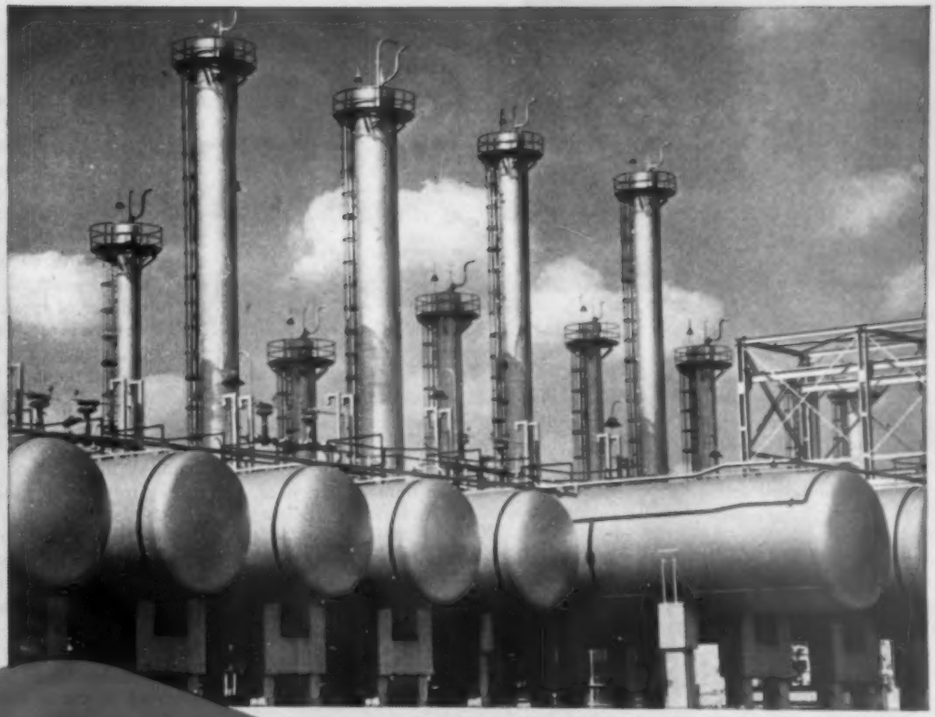

Pressure Storage Tanks with Fractionating Towers of the Distillation Unit at the new Shell Chemical Plant, Stanlow near Chester, Eng. (A Shell Photograph)

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Fig. 4 A swimming pool is part of the amenities provided for the crew of Shell's s.t.s. "ZAPHON."

same pump room are two 300-bhp pump units for handling the clean ballast water.

The installed cargo pumping and ballast pumping power in these supertankers may thus total some 4,600 bhp and call for a supply of 75,000 lb per hour of high-pressure steam.

The same basic consideration of minimizing port time forces continual rethinking of the propulsion machinery design problem. The oil tanker has inherent steam-consuming propensities in its requirements for cargo heating and in the procedures employed to clean the cargo tank interiors between cargoes. Cargo heating, initially to insure adequate pumpability, and tank washing with hot sea-water jets under high pressure may require all of 65,000 lb per hour of low-pressure steam. These are two of the major factors which have led to the increasing popularity of the steam turbine tanker. Use of main boiler steam as a power source for cargo pumping is another facility favoring the steam tanker, particularly so in the large-size vessels where the only feasible alternative would be some form of power takeoff from the main propulsion power plant.

The internal-combustion engine, in its various forms from the direct-coupled slow-running diesel to the gas turbine using either constant-pressure combustion or the free-piston gasifier, still vigorously contests the steam turbine and refuses to recognize the existence of a top limit of power, at least within the limit which is already set by considerations of propeller size and weight at about 25,000 shp for single-screw ships in the 16- to 17-knot class. The basic appeal of the diesel engine lies in its superior thermal efficiency. The three-to-two fuel consumption by weight, steam to diesel, involves more than a fuel-bill difference only. The extra fuel requirements of the steamship for the same length of voyage will invariably cut the steam tanker's pay load. The actual fuel bill will normally not reflect the three-to-two ratio against the steamship unless the motorship operates on fuel of the same boiler furnace grade. The bunker-weight penalty on a 22,000 shp steamer on a voyage from the Persian Gulf to North Europe could be 600 tons.

Steam turbine tankers, really to justify the popularity which they presently appear to enjoy, must in service consistently prove their claims to superior reliability and lower maintenance costs in comparison with the internal-combustion engine. This problem is to a large extent common to all marine propulsion plants and not exclusively to oil tankers, but turnaround times of less than 24 hours leave virtually no time for major repairs or for the immobilization of the machinery for routine inspection or overhaul.

Corrosion control in tankers is still one of the most predominant issues to be resolved, and in this respect research is continuing in various fields in an effort to find the optimum means for the prevention of corrosion.

The principal method of corrosion control which has been adopted over the past few years is the cathodic system, which protects the tank structure during the period when the most severe corrosion takes place; that is, when the tank is full of sea-water ballast. There is a certain amount of "carryover" of protection even when sea-water ballast is not continually present, since cathodic protection deposits a protective calcareous film on the steel surfaces of the tank. The corrosion in the cargo tanks which are not used for the carriage of sea-water ballast and cannot, therefore, be protected by the cathodic system—although not severe—cannot be overlooked, and in this respect the use of Epikote resin-based paints and corrosion inhibitors, as a means of steel protection, has reached a stage for practical application in new tankers.

One of the obstacles which had to be overcome before the application of Epikote paints to cargo tank interiors could become a practical proposition was to find an economical means of removing all mill scale and rust from the steel surfaces. This problem has now been largely overcome with the adoption by a considerable number of shipyards of mechanical shotblasting machinery capable of handling both ships' plates and sections, which will remove all mill scale from the steel work before the erection of the ship takes place.

Paint application and life has received a good deal of attention during the past year or two and, as a result of work done, we now look forward with confidence to using materials for above and below water duties which will not require attention for two years.

A practical technique of measuring the surface roughness of hull steel work has permitted a clearer understanding of factors which influence the progressive increase in skin resistance. Full-scale experiments with two sister ships undergoing measured mile trials before and after their annual drydockings (so far three years' test period) has indicated that the loss of speed during the first year's operation corresponds to 7% to 8% of the service power, whilst the loss during the second and third years is considerably less than this, and can almost be recovered by repainting during the annual drydocking. Certain reasons for the initial loss of speed have been assumed, and appropriate action is being taken to prove the theory.

Mechanical damage to the paint film on the ship's hull often gives rise to severe corrosion attack on the affected areas, and in this respect research is in progress on a simple form of cathodic protection for the hull by trailing over the ship's stern an expendable anode of aluminum wire. The wire is energized by a low-voltage generator, and is capable of passing large currents into the sea and back to the hull.

In view of the relatively long periods tankers are at sea compared with other classes of ships, an important trend has been to make the living quarters comfortable, and in the modern tanker each man has his own cabin. Special attention has rightly been given to recreational facilities, and today a swimming pool, game rooms, library, etc., are available for staff and crew. Provision has also been made in many tankers for cinematograph films to be shown each week, and in a number of companies the wives of senior staff are able to sail with their husbands.

At the commencement of this article, the aim of the tanker owner was stressed; therefore, proposed new methods of transports, such as carriage of oil in plastic containers under tow, the possible application of nuclear power to the conventional tanker, or the development of this power in a submarine tanker, all such proposals must be carefully reviewed to see how the cost per ton of oil carried would compare with the conventional method.

Within the next two or three months the "AURIS" (12,000-ton "Shell" tanker) expects to go to sea with a new gas-turbine propulsion unit. Whereas the US gas-turbine ship "JOHN SERGEANT" has a reversible propellor, the new installation in the "AURIS" will transmit its power mechanically through gearing and hydraulic couplings, all desired variations of the propeller speed being effected in the transmission system designed by 'Pametrada.' Operational results will be watched with great interest.

New forms of carriage will no doubt introduce additional problems—whatever they may be, it remains the responsibility of the operator and his designer to produce a safe and sound carrier; similarly it remains the duty of those engaged in the transport to adhere strictly to the regulations governing the handling of the petroleum cargoes, for it must be recognized that, in spite of continuing technical advances, the sea remains as formidable as ever. END

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Progress in oil industry recounted at Institute of Petroleum dinner

THE 1958 annual dinner of the Institute of Petroleum brought together 1,440 leaders of the industry and their guests—the largest such gathering in the history of the institute.

Progress of the institute during the past year was recounted by the Rt. Hon. Lord Geddes, CBE, president of the organization, in his toast to the guests. He spoke of the impetus which has been given its activities by the new headquarters building which was dedicated last November.

The institute now has eight branches in the United Kingdom—comprising more than half the membership—but Lord Geddes reported on the current healthy growth of overseas branches which he recently visited. On a recent trip to the East, the institute president visited branches in Kuwait and Bahrain and laid plans for the organization of a branch in Iraq and revival of the Burma branch.

Lord Geddes suggested that the institute should become more international in character in line with the development of the industry itself. He suggested that such a move would tend to improve international friendship far beyond the immediate technical field.

In his Asian trip, Lord Geddes visited Japan, and was greatly impressed by Japanese shipbuilding activity. "The oil industry has become one of the largest customers of the shipbuilders of the world," he said; "and, though many companies still incline to build their ships where they have always built them, that situation can only last so long as prices remain reasonably competitive. What I saw in Japan left me in no doubt that many of the shipbuilders of Europe are no longer competitive. Japan is now the biggest shipbuilding nation in the world. I saw 40,000-ton tankers being turned out in four months from keel to delivery—excellent ships, and at prices very considerably below those obtainable in some European yards. These facts are often dismissed either on the score of low wages or inferior ships. The former may be partly true, but the latter not at all. They are building good ships, and the fact is that the shipbuilding industry of Europe—including this country, both management and labor—will have to tighten its belt if it is to survive in the face of that competition.

"There is never a time when the oil industry is not faced with worries, and indeed there is seldom a time when there is not in some part of the world what appears to be a critical situation. Today, contrary to all the forecasts, the expected rise in consumption has not materialized; production and refinery runs are being curtailed; and good ships are to be seen in many ports of the world swinging at their anchors unemployed.

"Let us look back, however, to the situation as it stood a year ago. The Suez Canal was closed; the industry was under great strain in trying to maintain essential supplies. Petrol was rationed; but, far more serious, we and our friends across the Atlantic were scowling at each other. Memories are short, and even now it is not easy to recall the atmosphere of that time. By one means or another, those difficulties were overcome; and, while it is true that new problems have taken their place, we can be confident that these also are capable of solution. Above all, it is not unfair to say that, both within itself and through the friendly channels of government, the international atmosphere of the oil industry is immeasurably better than was the case 12 months ago."

Sir Owen Wansbrough-Jones, KBE, CB, chief scientist, The Ministry of Supply, proposed the toast to "The Petroleum Industry and The Institute of Petroleum," in a witty address in which he paid tribute to the development of the industry in the past 100 years.

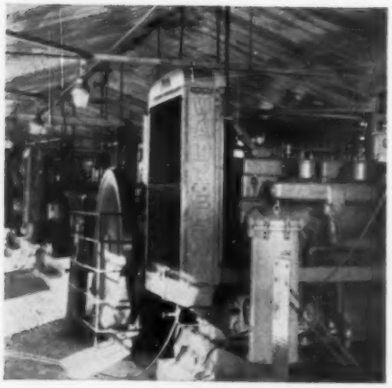
"The imagination that always has bubbled, and still bubbles, in the petroleum industry has as much cause now as ever it had to do its work," he said. "Diversification can only be carried out on a securely based industry and, must be carried out while that industry is still solid and expanding, before it becomes static, let alone declining." He asserted that old age has not crept up on the oil industry, since it is adapting its products as raw materials for other industries—the plastics industry, petrochemicals, insecticides, therapeutic substances, etc.

"But essentially power is your business," he said, "and it is in the realm of power with theorizing of atomic energy that there must surely be coming the biggest changes. What you can do about it, I do not know; nor do I know what you are doing now. But I think there is one certain problem that we can see—the need for power storage. Your industry for years has been taking out the accumulated reserves of energy stored by physical, chemical, and biological processes at many millions of times the rate that they are put down. New reserves you will find will obviously extend their period of life. Now we are coming to the period when other reserves of power again become unlimited, but we shall want to find means of storing it in off-peak times, and transporting it—not necessarily by cable; and I sometimes think that it is this field of research and development that is going to be most necessary and will, therefore, pay most handsomely to those who are successful in finding means of doing it. I am sure there is a big part for the petroleum industry who, I think, may have the raw products needed under their own hands in doing this."

Discussing technological development in the industry, Sir Owen said that "the principal task of the institute is to see that the

(Continued on page 78)

Rt. Hon. Lord Geddes, CBE, President of the Institute of Petroleum



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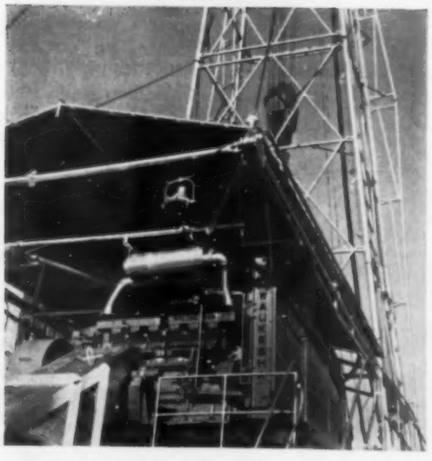
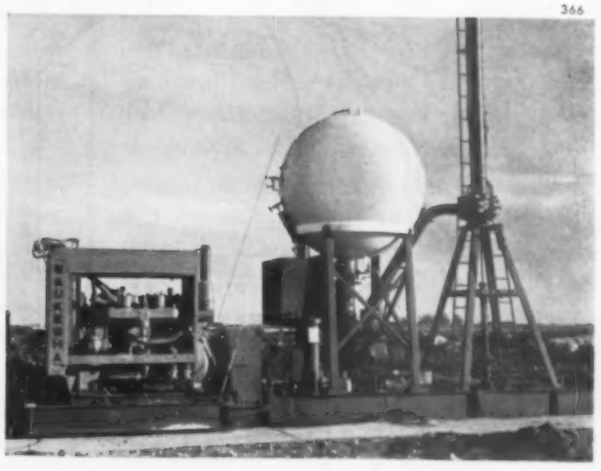




World pipeline construction rising

Major projects under way . . . highest on record

UNDER the spur of rising consumption needs, pipeline construction is booming around the world. There are now more major projects under way or planned than in any previous year—many of them based on transport of natural gas but with major crude lines in the offing as well.

The major crude lines being considered are in Canada, Latin America (Bolivia, Argentina), Algeria, and India. These are supplemented by a host of projects, large and small, as covered in the following review.

ALASKA: A joint venture, Alaska-Yukon Refiners and Distributors Ltd., has announced plans for a $6 million refinery at Haines, plus two pipelines. One line costing $3.5 million would link Haines and the wartime-built Canol pipeline. The other would go from Tok Junction, far up the Canol line, to Anchorage.

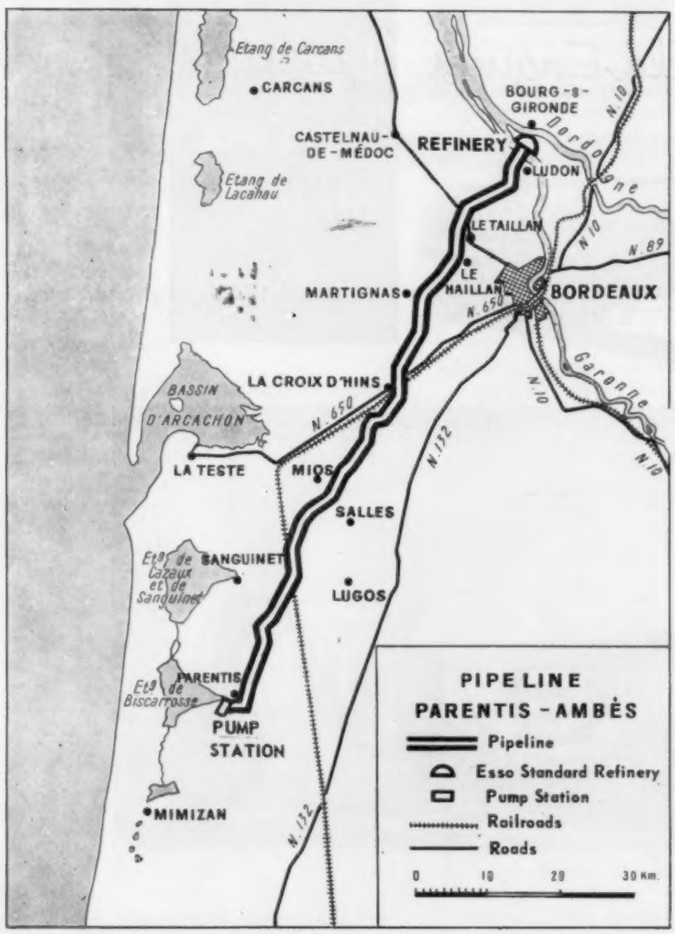
ALGERIA: A 6-in. pipeline has been laid from the discovery at Hassi Messaoud to railhead at Touggourt, from whence the oil can be taken by tank car to Philippeville. A major line is planned later as part of a budgeted $105 million during the 1958-60 period for transportation and development.

There are two possible routes for the new major line. One is from Edjélé and Tiguentourine to Hassi Messaoud and straight up to the port of Philippeville. The other is from Edjélé and Tiguentourine through Tunisia to the port of Gabes or to the Libyan port of Tripoli. An all-Algerian route is the probable French choice, since it would not be at the mercy of another government.

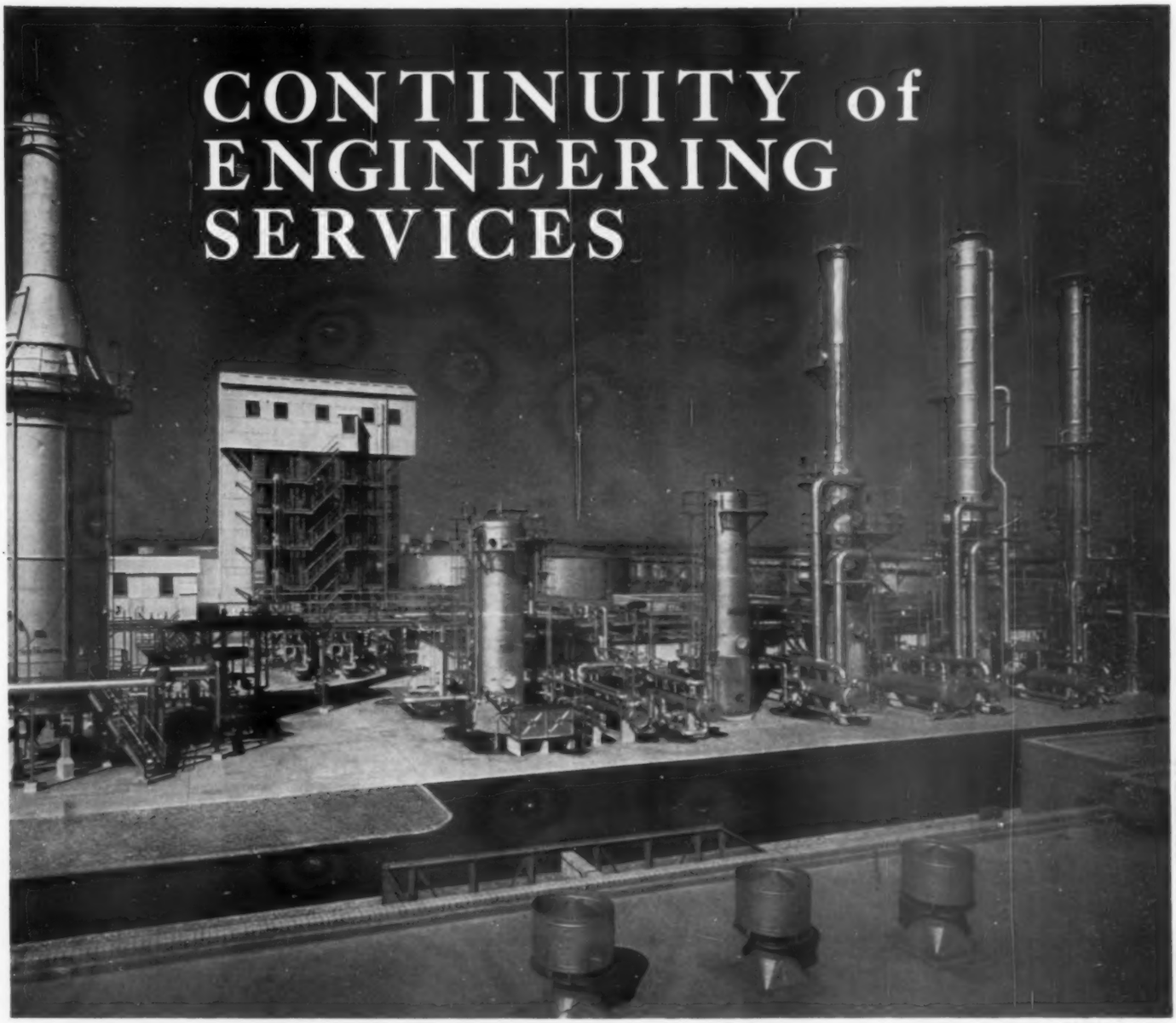
A project of "prime importance" to Algeria is the planned construction of a gas line from the Hassi R'Mel area—80 kilometers south of Laghouat—to Affreville. The line is to branch out—one section going to Oran and the other to Algiers.

ARGENTINA: During 1957 the government called for bids on: (1) a 58,000 b/d crude line from Campo Duran fields to Salta and San Lorenzo, including 8 pumping stations and storage plants at both ends and at intermediate points; (2) a gas line from Campo Duran to Buenos Aires, about 1,700 km, of 7 million cubic meters daily capacity, plus 4 compressor stations; this also included 46 separation stations and radio communication facilities; (3) treatment plants for 10 million cubic meters daily at Campo Duran, plus a 6,000-kw power plant; (4) an oil pipeline from Lujan de Cuyo field in Mendoza to Buenos Aires, about 800 km, of 6,300 cubic meters daily capacity with 3 pumping stations, storage plants at both ends and at three intermediate points; radio communication facilities were included. The final winner for part of the contracts was Tecnica Industrial Petrolera SA (TIPSA), a local company in which Fish Engineering & North American Utility and Construction Co. are involved.

AUSTRIA: At present there are less than 100 miles of pipeline in Austria. They include one small line of about 40 km length to Sokeral; one natural-gas line to Vienna; and one crude line to the Lobau refinery. The government and a private company are on the point of building a network of



JANVIER 1958



British Hydrocarbon Chemicals Limited recently placed in operation a Tetramer Plant employing the U.O.P. Process at their Grangemouth, Scotland chemical complex.

Stone & Webster Engineering Corporation, together with its affiliate E. B. Badger & Sons Limited engineered and constructed the new plant as well as the existing facilities for the production of Ethylene, Ethanol, Isopropanol and Detergent Alkylate. Work is now in progress on Polyethylene and Cumene-Phenol Plants.

The charge stock for the Tetramer Plant is propylene from the two existing Ethylene Plants. Part of the capacity of the new plant is used as a charge stock for the Detergent Alkylate Plant.

Stone & Webster Engineering Corporation's world-wide experience and client confidence, typified by its long association with British Hydrocarbon Chemicals Limited, is at your disposal.

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gas lines, with about 100 million shillings of government financing.

OeMV will lay a line soon from Zwerndorf gas field across the Danube to refineries at Schwechat and Kledering. Niogas Co. will continue its line from Schwechat to Weiner Neustadt and Gloggnitz.

BOLIVIA: Bolivia currently has 765 miles of crude pipelines, and is adding to them on both sides of the country. The 4½-in. Camiri-Santa Cruz line was completed in August 1957. Work has also begun by Williams Bros. on a 215-mile line from Sicasica in the Bolivian interior to Arica on the Pacific Coast. The line is 171 miles of 10-in. and 44 miles of 8-in. pipe. Capacity is 6,000 b/d initially—with inherent capacity of 50,000 b/d with addition of two pumping stations.

Another line is proposed from Villa Montes, Bolivia, across the Paraguayan Chaco to Asuncion, some 450 miles. Agreement on the line was signed early in 1957, and a French company, Fives-Lille, will build the Paraguay section of the 6⅝-in. line. A second agreement foresees another line (financed by Bolivia) through Paraguay, for export.

BRAZIL: Completion of heated pipeline facilities from Bahia fields increased Brazil's production to about 25,400 b/d during 1957.

CANADA: There are two major crude lines in Canada, Trans-Mountain going to the West Coast, and the Interprovincial line running toward eastern Canada. Trans-Mountain raised its capacity to 240,000 b/d during the summer of 1957 by the addition of pumping stations. Interprovincial completed its 156-mile 20-in. extension beyond Sarnia to Port Credit in the Toronto region during September 1957, and deliveries began during October.

A new company was formed for transportation of oil from the Athabaska tarsands region. The company is Bituminous Oil Pipeline Co., which will build a 250-mile line from Athabaska to Edmonton. It is owned jointly by Royalite Oil Co. Ltd. and Can-Amera Oil Sands Development Ltd. Size of line has not been announced.

A new crude line is being studied from the Peace River region of northern British Columbia to tidewater at Bella Coola in Vancouver. The line would be about 350 miles long. Dutton-Williams Bros. Ltd. have been retained to survey the land for Act Oils Ltd., a subsidiary of Canada Southern Petroleums Ltd. Development of natural gas has shown a phenomenal increase with the completion of the two large gas lines, Westcoast Transmission and Trans-Canada Pipe Lines Ltd., running to the west and east coasts, respectively. Trans-Canada will be to Winnipeg soon, and eventually will supply the Toronto and Montreal areas.

The Borden Commission was assigned in 1951 to make a special inquiry into operations of Trans-Canada Pipe Lines Ltd. Companies other than Trans-Canada must await outcome of commission investigations before any plans for export will receive governmental approval.

The 750-mile $100 million Westcoast Transmission line was completed in October 1957. By January 1, 1958, the line had reached its initial capacity of 440 mmcf daily. Additional compressor stations will bring this to 660 mmcf daily, and construction of a parallel line during the next few years to meet market demands would boost capacity to 800 mmcf under present planning.

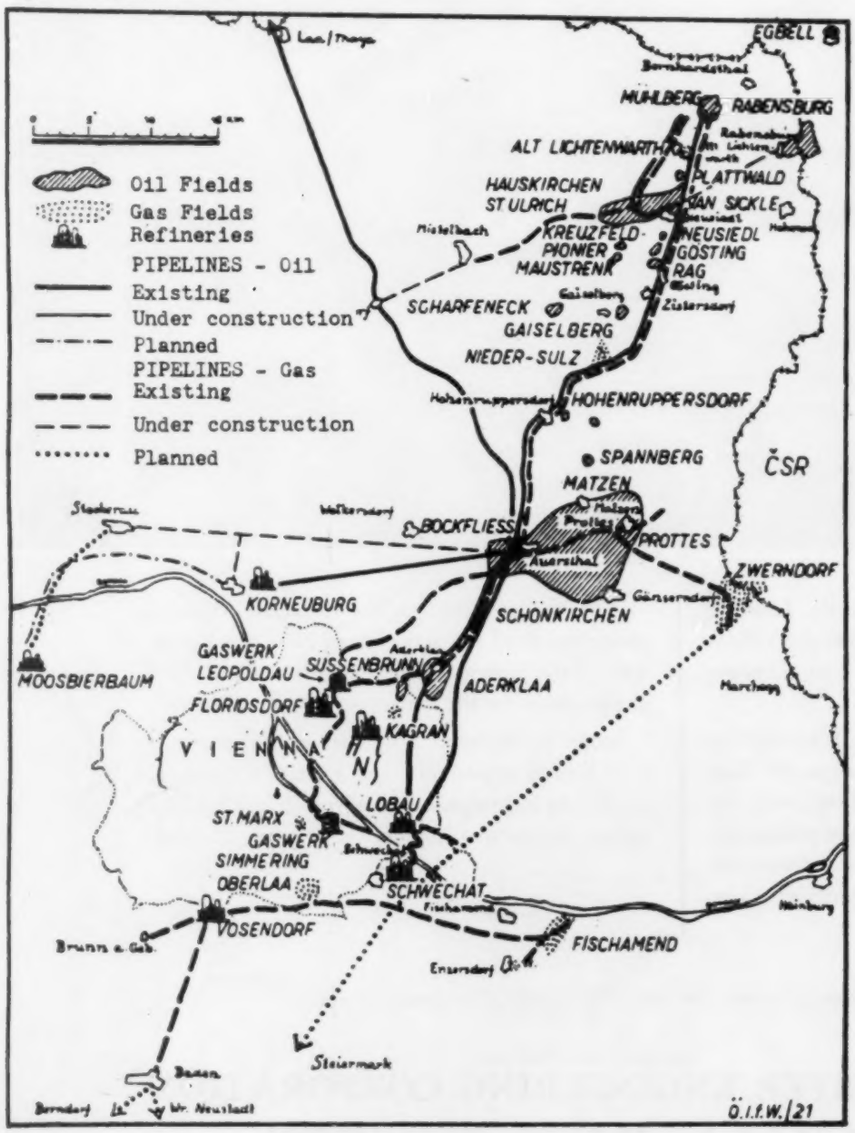
A proposed $330 million pipeline from Alberta to California will be built subject to governmental approval in both USA and Canada. Present plans call for completion late in 1960, with an initial daily delivery of 450 mmcf. Gas would be purchased for distribution in the California market.

Total pipeline mileage—both oil and gas lines, but not including distribution, sale laterals, and line looping—was about 9,000 miles at the end of 1957. About 2,000 miles were laid in 1957—not including gas lines and looping, which would make a total of 3,000 miles in 1957.

Late in 1957 an independent study of the feasibility of a major crude line from western Canada to Montreal was undertaken by Walter J. Levy, economic consultant. The study showed that, while the Montreal market was not a logical avenue of expansion for western Canada's crude (the distance from Montreal to Venezuela is less than to Calgary) still, given some protection and a line of sufficient size, crude could compete from western Canada.

A joint study of the cost of such a line was done by a group of companies and presented by Charles S. Lee of Western Decalta Petroleum Ltd. It estimated cost of a 30-in. line at around $350 million—which would deliver about 312,000 b/d to Montreal by early 1961. Per-barrel tariffs were estimated at about 55¢, to permit delivery of Redwater crude at Montreal for

Pipelines in Austria



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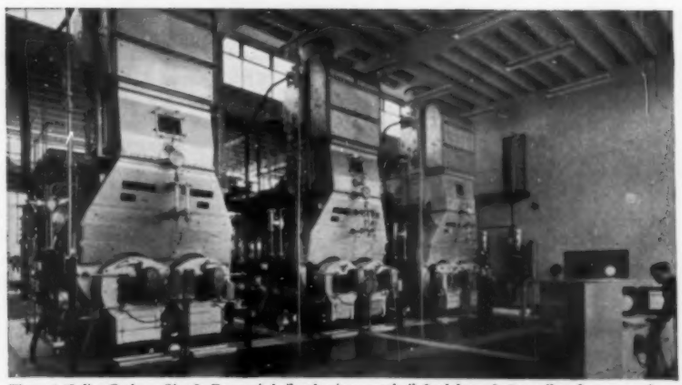
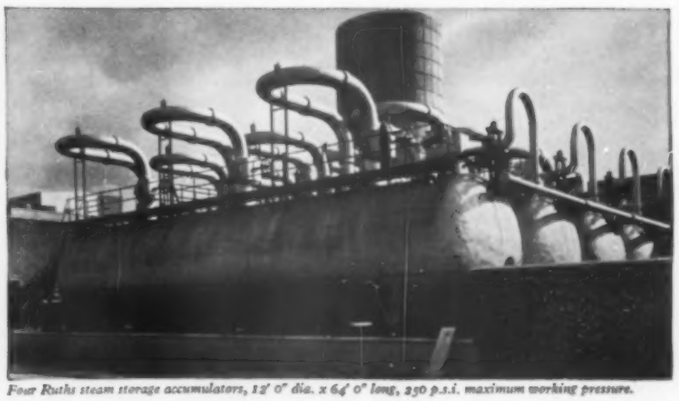


Three 9' 6" dia. Cochran Sinuflo Economic boilers having a total oil-fired duty of 38,000 lbs. of steam per hour at 250 p.s.i.



Four Ruths steam storage accumulators, 12' 0" dia. x 64' 0" long, 250 p.s.i. maximum working pressure.

Steam at the rate of one million pounds per hour is supplied for test purposes at the works of Bristol Aero-Engines Limited by Sinuflo Economic boilers and Ruths steam accumulators made by Cochran & Co., Annan, Ltd. At this high rate of steam flow, no pressure drop is reflected back to the boilers and no change is necessary in the boiler firing rate. Similar plants, usually much smaller, are applicable to any steam-using industry where severe fluctuations in steam demand present a problem.

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$3.25 per barrel, or slightly lower than present Venezuelan landed price of $3.36.

The proposal has met opposition based on the uncertainty of USA import policy and future price structure. Its future is still uncertain at this writing.

EGYPT: A proposal was reportedly made by the government of Egypt to several companies—including Getty Oil Co., Ralph M. Parsons Co., and Onassis Shipping Lines—to construct a 100-mile pipeline along the canal—permitting large tankers to lighter at the bottom of the canal, make the canal transit, and thereafter load at the other end. No action has been taken on the proposals.

MUSCAT & OMAN: A survey has been undertaken by Cities Service Co. for an offshore loading line.

FRANCE: A 550-mile gas pipeline is being constructed from Lacq field, in the south, to Paris. Branch lines will be of 24-in. pipe at the southern end, narrowing to 16-in. pipe the last 250 miles into Paris.

Esso Standard of France has received permission from the Bordeaux port authorities to lay a deep-sea pipeline across the estuary of the Gironde, France, to carry oil from the Parentis field to Esso's new refinery at Ambes, on the north side of the estuary.

GERMANY: All existing German oil pipelines are of local importance only—none of them being longer than 19 miles. The total oil pipeline net consists of 100 miles of crude lines, 70 miles of products lines, and 190 miles of gathering pipes.

A contract for a complete pipeline network was let by Nord-West-Oelleitungs GmbH to Ruhrgas AG, of Essen-Ruhr. Contract calls for plans for a network to the various refineries of participating companies in the Rhineland and supervision of construction. Meanwhile a line is now going in from Oelleitungs GmbH to existing and planned refineries in the Rhine-Ruhr area. Six German companies have combined into Nord-West for building the line—including Esso AG, BP Benzin, Petroleum Gesellschaft, Ruhrbau Mineraloel-Reffinerie GmbH, Ruhrchemie AG, Scholven Chemie AG, and Union Rheinische Braunkohlenkraftstoff. The line will be 350 km long, 28-in. in diameter. Up to 180,000 b/d crude a year will be carried initially, and ultimately 800,000 b/d. The line is to be completed by the end of 1958.

IRAN: Plans have been made by the consortium for construction of a 26-in. to 28-in. pipeline from the Gach Saran field to the Persian Gulf, and a 16-in. to 20-in. line from Agha Jari to Bandar Mashur.

The 300-mile Ahwaz-Azna section of Abadan-to-Teheran 10-in. products line was completed in 1957.

A major pipeline was proposed by NIOC, and tentative arrangements for its financing were made with Allen and Co., an investment house in New York. The line would be costly—about $250 to $500 million.

A $5 million 146-mile 6-in. 6,000-b/d line is to be built during 1958 from Asna to Isfahan, according to press reports.

A line may be built by the consortium to Kharg Island, about 20 miles from the coast, or at Ganaweh, 50 miles north of Bushire.

INDIA: An agreement between the government, Burmah Oil Co., and its subsidiary, the Assam Oil Co., was announced December 6. A joint company will arrange for construction and operation of a 80,000 b/d line and related facilities for the transport of crude from Nahorkatiya, Hugijan, and Moran, in Assam, to Barauni in Bihar. To meet the foreign-exchange cost of the first of the two stages of construction of the pipeline, the Burmah Oil Co. has offered to advance a sterling loan of £10 million to the company, on terms to be agreed upon between the company and the government.

Pipeline Construction Co. (USA) was commissioned to carry out an engineering survey by December 1957. On a rough estimate, the line from Assam to Calcutta will be about 800 miles, while the branch line to Barauni will be 125 miles long.

INDONESIA: Caltex has announced a major expansion program whose ultimate objective is to link Minas field by pipeline northward to a deep-water outlet near Dumai on the Rupat Strait. Construction of a 30-in. line, to extend over 30 miles through the jungle, from Duri to the coast, is about to begin. As part of the main pipeline project between Duri and the Dumai deep-water terminal, a feeder line from Bekasap to Duri will be constructed.

Standard Vacuum Oil Co., late in 1957, opened its new Lirik pipeline. The company has spent several years designing and building the special heating facilities needed to handle the high pour-point crude, which solidifies at 105F.

ISRAEL: In April 1957, a 150-mile 8-in. 17,000 b/d pipeline was completed at the port of Elath, on the Gulf of Aqaba, to Beersheba. A proposal for a large pipeline to flow from the Gulf of Aqaba to the Mediterranean—supplanting in part the Suez Canal—was proposed during 1957, but no commitments were made.

ITALY: In Sicily, a 41-mile 14-in. pipeline was laid in 1957 by Gulf to the Augusta tank farm near the RAISOM refinery. A 4.2-mile extension of 30-in. line to the Magnisi peninsula is being built which will deliver 15,000 to 20,000 bbl per hour by gravity.

A cheaper alternative to the proposed oil pipeline from San Ilario, near Venice, to Vienna is now being considered in Italy. It would be a 28-in. line from Venice to Munich and on to Regensburg in Bavaria.

IRAQ: BPC will build in 1958 a $3 million offshore loading terminal at Kahor Abdullah with 38-in. submarine loading lines to permit 180,000 b/d of BPC oil to be loaded there. IPC plans to increase pipeline capacity by about 30% from northern Iraq fields to the eastern Mediterranean by the end of 1959.

During 1957 a pipeline from Iraq and Kuwait through Turkey to Iskenderun was contemplated by a consortium of oil companies in the Middle East. There has been little heard of this line in recent months, and the project is now considered abandoned.

KUWAIT: Kuwait Oil Co. will increase facilities with five sea berths—each berth fitted with two submarine lines. Two further sea berths will be installed, each with two submarine lines. The first of the new 24-in. submarine lines was launched May 11, 1957. To speed these new loading lines, a new 32-in. gravity line is being laid to connect the tank farm at Ahmadi with the oil-loading berth.

MEXICO: As of September 1957, Mexico had a total of 4,000 miles of oil and gas pipelines. During 1957, 126-mmcf per day gas line from Reynosa refinery to the border, connecting with Texas Eastern Transmission at Beaumont, went into operation.

A $16 million gas line to Mexico City from the gas reserves in Tabasco, southeastern Mexico, is to be built. The line will be an 18-in.-diameter connection from the Jose Colomo field to the Minatitlan refinery in Vera Cruz, and 24-in. from there to Mexico City.

A 650-mile gas line—partly submarine—from Campeche, in the center, at the southeastern end of Mexico to Cuba, and possibly on to Florida, has been proposed by E. W. Pawley. Pemex has under construction several new pipelines. They include: (1) an oil line from Tamaulipas fields to Tampico; (2) oil and gas line from Xacotla to Alamo; expansion of the gas-collection system in Poza Rica area; a gas-collection system in Reynosa district; and a gas line from Reynosa to Monterrey.

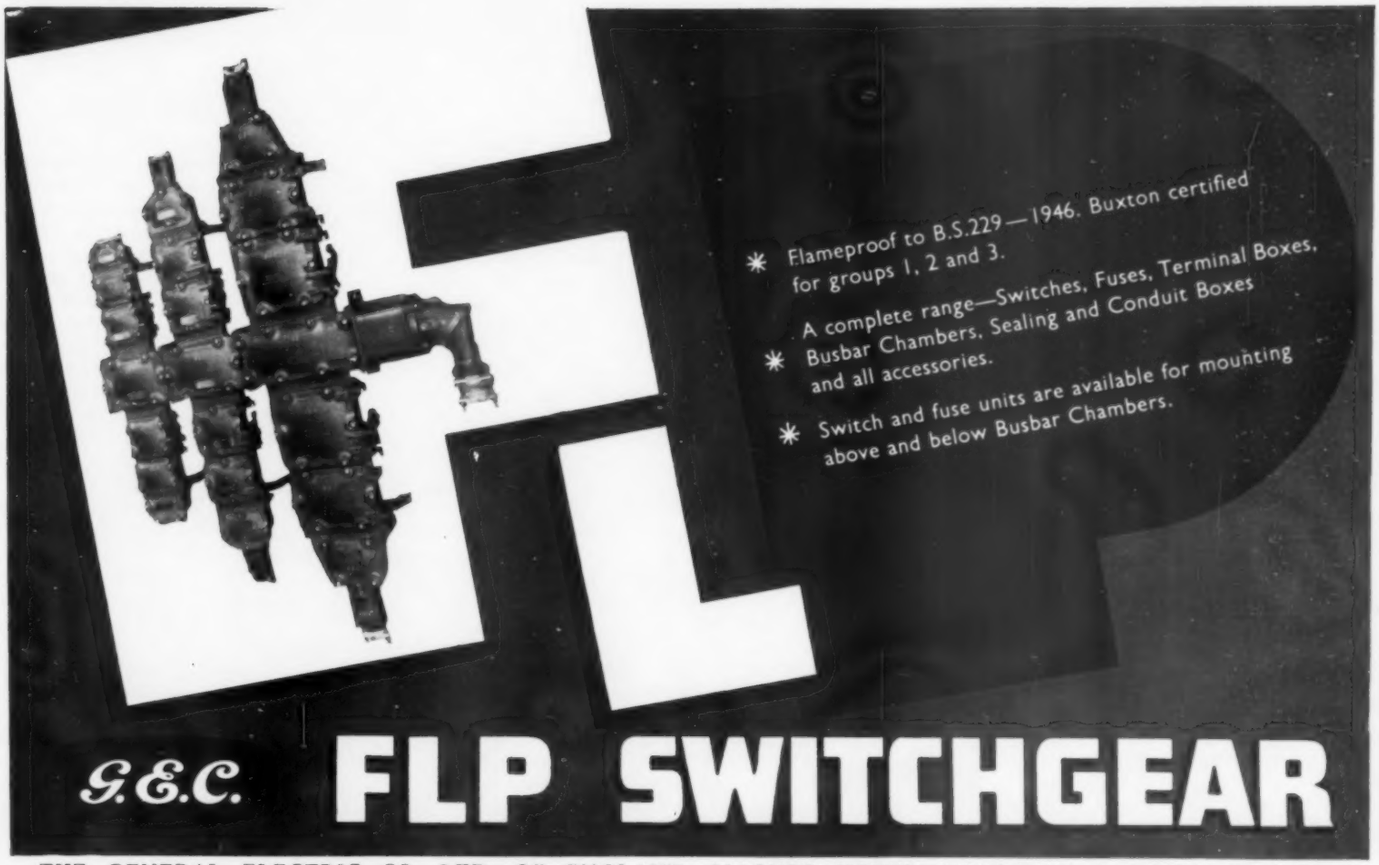
HOLLAND: Holland's gas pipeline network is expanding rapidly, and an addition made in 1957 from the Caltex refinery (Pernis) will supply gas through a line being constructed to Utrecht. NAM is committed to deliver, over the next 20 years, at least 14,125,000 cu ft daily to the government's pipeline network. (All pipeline facilities are owned by the government for gas distribution.)

NIGERIA: A contract has been awarded to Taylor Woodrow (Nigeria) Ltd. for a 465-mile 10-in. line from Oloibiri fields to Port Harcourt, which will enable production tests of the Oloibiri field during 1958.

PAKISTAN: There are no crude pipelines of importance. The Sui gas line, 348 miles long, 16-in. in diameter, has a capacity of 110 mmcf daily. It was constructed by Sui Gas Transmission Co. Ltd., which is owned 30% by the government's Industrial Development Corp. and 70% by Burmah Oil Co. Ltd., which will manage the line. A second 16-in. line is being built to Multan in the Punjab region. This line is wholly sponsored by the government's Industrial Development Corp., and will be completed in 1958. It will probably be extended 200 more miles to Lahore by 1960.

PARAGUAY: A European-American group began, in November 1957, construction of a 10,000 b/d crude line from Bolivia's southeast border to Asuncion—plus a 3,000 b/d refinery at its terminus.

The contract has been awarded to a group headed by Cie. Fives-Lille, French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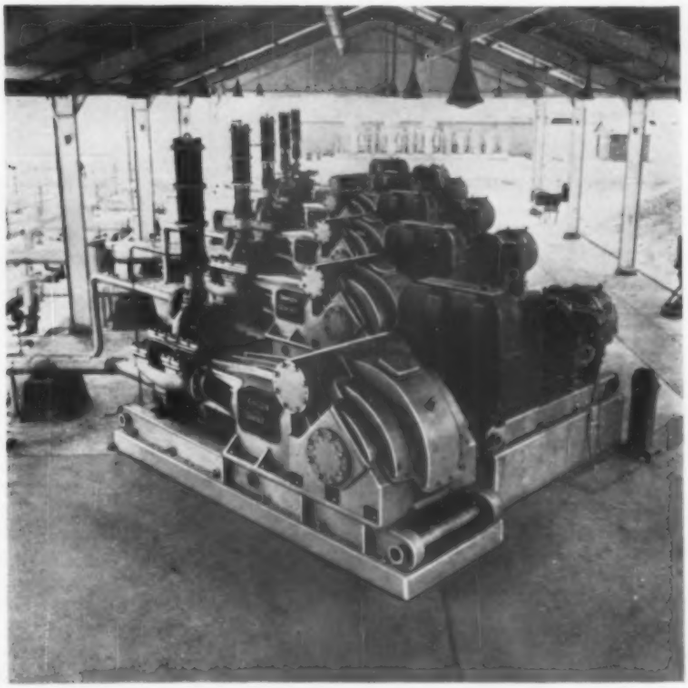

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engineering firm. The 422-mile line will be built by Termec-Hardeman Venezuela SA, of Caracas, under the supervision of Paul Hardeman Inc., of Los Angeles. Comptoir Franco-Bèlge des Tubes SA will supply 6⅝-in. pipe. Total cost of the overall project is $11.8 million, with $720,000 of this payable in Paraguayan guaranis at the rate of 100 to $1.00.

RUSSIA: Pipeline transport of crude in 1957 reportedly increased by 20% compared with 1956. Several lines were completed during 1957, including the 114-mile Omsk-Tatarskaya gasoline pipeline which will be extended to Novosibirsk; the 279-mile Almetyevsk-Gorkiy crude line, the second 279-mile Almetyevsk-Molotov (PERM) crude line, and the 196-mile Shirnovskiy-Stalingrad crude line. A 3.4-mile Artem Island-Apsheron Peninsula under-water crude line was completed. Laying of a 12.4-mile under-water crude line from Neftyanie Kamni to Shiloy Island also began in 1957. Several sections of the 2,500-mile Tuymazy-Irkutsk oil line were completed.

The gas-pipeline network, without field gathering lines, was 4,099 miles at the beginning of 1957; 77% were used for natural gas. By 1960, 9,315 miles of gas pipeline are to be added. Future gas pipelines are to be controlled by radio.

The total length of all trunk oil pipelines in the USSR is expected to go up from 11,500 kilometers (with an average diameter of 20 in. and with 101 pumping stations) as of January 1, 1957, to 14,500 kilometers by 1960. In 1955, pipelines accounted for 77% of all crude-oil transport in the country. This proportion is expected to go up to 84% in 1960.

SAUDI ARABIA: The most important recent addition was the completion of a third pipeline, 44 miles long, 30-in. to 32-in., from Abqaiq to Qatif Junction, with a capacity of 330,000 b/d.

Extension of the Uthmaniyah-Abqaiq pipeline boosted producing capacity by another 100,000 b/d. New crude-oil gathering lines connecting new wells in Abqaiq and Ghawar to gas-oil separator plants were also completed, to increase capacities.

A new pumping unit at Wari'ah was installed, powered by a 5,000-hp remote-controlled gas turbine. Another similar unit was constructed during 1957 at Tufaih, 37 miles from Qatif Junction, along the pipeline to Nariyah and Qaisumah.

The Safaniya-Ras Tanura crude 22-in. line was completed in April 1957. International Bechtel Bros. Inc., of San Francisco, were contractors. The line is capable of delivering 125,000 b/d. It is planned to install a second pump station at the approximate midpoint of the line, equipped with pumps aggregating about 5,000-hp, to permit a maximum rate of 190,000 b/d by mid-1958.

Tapline delivered 12,225,368 bbl to Sidon in October 1957 for an average of 374,364 b/d—an all-time record. Auxiliary pumping units were to boost Tapline's capacity to 435,000 b/d by January 1958.

TURKEY: Two products lines have been completed in the past two years—one covering 250 miles from Antalaya north to Eskisehir, and a 200-mile 4-in. line from Eskisehir to Panerma. Both are finished. A 450-mile 8-, 6-, 4-in. products line for NATO, from Iskenderun to Batimn, begun in 1955, is still under way.

During 1957, a 1,500-mile line costing an estimated $840 million was proposed. The 40-in. line would handle 1,400,000 b/d of Middle East crude, and would run from the Persian Gulf to Iskenderun.

On June 6, 1957, amendments were passed to the Turkish oil law to allow transportation (and refining) of crude petroleum of foreign origin within Turkey.

SPAIN: There are no large pipelines. A 485-mile products line was built from Rota on the southeast coast, diagonally across Spain, to Zaragoza—completed in 1957. It supplies USA air bases. The line is telescoped, including 12-, 10-, 8-in. sections.

A natural-gas line was to be built from the Guadalquivir River valley 800 km to the north of Spain, but reserves of gas found so far are probably too small.

UNITED STATES: As of the end of 1956, there was a total of 51,336 miles of gathering lines for crude and products, and 91,350 miles of trunk lines; 4,459,451,550 bbl of crude and products were transported, an increase of 10% over the previous year. Deliveries of crude oil by pipelines are estimated to increase to about 8,300,000 b/d by 1965, and deliveries of products by pipeline will about double in the 1956-65 period, to 5,300,000 b/d. This includes natural-gas liquids as well as products from refineries. Expenditures are estimated at $850 million in 1957, $1 billion in 1960, and $1.45 billion in 1965—for a 10-year total of $11.5 billion.

Gas utilities and pipelines spent $3.13 billion in 1957 for new construction and expansion—37% over the 1956 all-time high. Expenditures over a four-year period (to 1960) are forecast at $8.7 billion.

UNITED KINGDOM: The port of Milford Haven in installing unloading lines, and British Petroleum is building a 60-mile pipeline to the Llandarcy refinery.

VENEZUELA: Private gas pipelines in Venezuela comprise: (1) the Venezuelan Atlantic line from the Las Mercedes fields to Caracas and westward to Valencia; (2) Eastern Venezuelan Gas Transport Co. (owned by Creole, International, Mene Grande, and Shell) runs some 60 miles from Monaco to Puerto La Cruz on the Caribbean; and (3) Cia. Shell de Venezuela has completed "Pagline," a new 100-mile 20-in. line which now carries natural gas from the La Paz field in Maracaibo district to Cardon oil refinery on the Paraguana peninsula. The capacity of this line is 100 million cubic feet per day.

The government is constructing the Anaco-Caracas leg of a gas pipeline. Petrogas SA is working on this, the largest natural-gas pipeline project currently under way in South America. The line will be 207 miles long, 26 in. in diameter. There will also be a distribution system in Caracas. Fulghum Contracting Corp., of Harrisburg, Pa., are consultants on the line. With a capacity of 200 million cubic feet per day, estimated cost of the main line is $21.45 million. The line later will be extended to Guacara—and, still later, west to Barquisimeto. It will also extend south from Monaco to the interior of Venezuela, where it will supply Ciudad Bolivar, at Puerto Orbaz.

Almost all of the crude lines in Venezuela are owned by the five major private oil companies. Creole's is the largest pipeline system in Venezuela—totaling about 485.4 miles of crude lines varying in diameter from 8 in. to 34 in., plus an 11-mile 8-in. refined-products line. Creole is now building a 92-mile 30-in. aboveground pipeline from Temblador to its refinery at Caripito. Initial 50,000 b/d capacity is relatively low, since it will be transporting a low-gravity high-viscosity crude. Completion is scheduled for July 1958.

In western Venezuela, Creole completed during the first quarter of 1958 a 26-in. 9-mile crude line from Ule to La Salina, with initial capacity of about 450 b/d.

Creole has approximately 900 miles of 4-in. and 6-in. pipe on the bottom of Lake Maracaibo connecting its 1,570 wells to flow stations, plus 300 miles of 6-in. to 12-in. crude lines from flow stations to the shores of the lake.

Cia. Shell de Venezuela has a large pipeline system which has been expanded by about 621 miles in the past six years. Of this, about 453 mile correspond to the main lines—including Lapline, Lightline, and Pagline.

Outstanding pipeline construction during 1957 was completion of the new Socony-Sinclair 20-in. 100,000 b/d line from Silvestre field, in the state of Barinas, some 212 miles to El Palito terminal near Puerto Cabello in the state of Carabobo on the Caribbean coast. With all three pumping stations in operation and two similar units at a possible booster station, this system can be increased to 150,000 b/d.

A new 32-mile 8-in. 19,000 b/d line was completed to Puerto La Cruz from Aguasay, new deep field brought in by Sinclair and Pancoastal Petroleum Co. The new line, wholly owned by Venezuela Petroleum Co. (Sinclair), links with the 16-in. Amana line which moves crude for companies from the Santa Barbara area to the port. Sinclair, Mene Grande, and Creole are joint owners of the larger crude trunk lines.

Mene Grande has a 97-mile 30-in. pipeline currently under construction from Anaco toward the Oficina pump station. It will increase the 350,000 b/d capacity of the existing system by 50,000 b/d. Consisting of double 16-in. lines from Oficina pump station at Monaco, a 26-in. line from Monaco to Puerto La Cruz and a 16-in. line from Travieso parallel the main system. Mene Grande has just completed a 25-mile 16-in. line from Ceuta, Lake Maracaibo, to Bachaquero.

Mene Grande also plans to start soon a 16-mile 6-in. LPGas line from Anaco to Puerto La Cruz, to supply the Puerto La Cruz area. END

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Progress in Oil Industry

(Continued from page 68)

people in the petroleum industry not only do think, but are equipped to do so. The institute's wide range of interests and its attempts to bring together as many different interests and disciplines as are associated with your industry is to my mind farseeing. Strength in these modern days comes, I am sure, not just from diversification of output of products but, also—and very much so—from diversification of approach. In parenthesis, this is one reason why I most thoroughly believe that the technical part of my own ministry, the Ministry of Supply, can be so strong. It can bring to bear on a single problem such a wide range of scientific and engineering approaches with expert knowledge of them all.

"I understand it to be one of the main functions of the institute to bring together not just petroleum technologists, but also the economists, the operational research workers and the management consultants, transport executives, drilling-equipment manufacturers, and all the different sorts of scientists who serve it. This to me is an admirable objective."

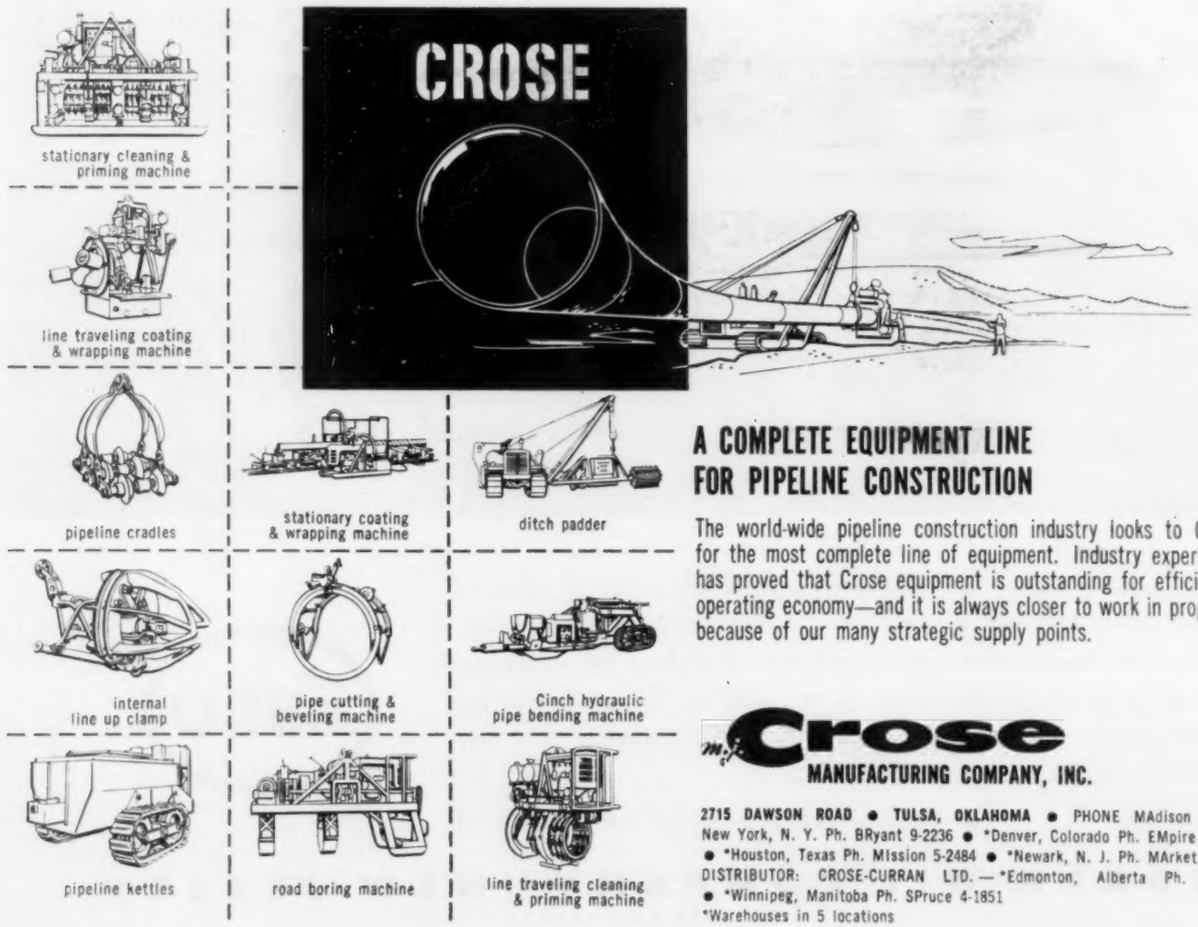
The speaker said that his message to the industry is that there is a need for the highest intelligence in big industry today—which intelligence is not only to be found, as was once thought, amongst the arts and classical students (though it is on record at the Cambridge University Appointments Board, and to me it is encouraging, that one great oil company was the first technological group specifically to ask for classic scholars to enter their organization). Nor is the highest intelligence to be found only amongst technologists; I would only say that it can be found there in very high degree—and not just technological ability, but also a great deal of general administrative ability. For years the industry has, I believe, been making as good use of the intelligence it has within it as any other organization, and I believe it is nearly as true to say that the chronic shortage in this and every other country of true management and technological ability arises at least as much from misuse of the best qualified as it does from any true shortage. National steps are now being taken—late, but not too late—to remedy the shortage. National steps cannot remedy misuse; that must be left to the organizations. It is a part of personal management in which again I think your industry has a deservedly high reputation.

"The outsider, the casual readers of the papers, may think that oil men are gamblers by instinct. If so, they would be wrong. The oil industry has got where it is by being intelligent—not by gambling or by playing hunches. You, I believe, have not gambled; you have tried to use a systematic objective approach and, when things have gone wrong, it was through lack of facts—not your own inability to deploy and use them. This, I think, is what you have always done, and which you will certainly have to do as much in the future as you do now. The work of the institute should help in this direction.

"In fact, the eggheads of the world are the people you want. Let them be cherished, and let them be used. But this does require that every possible means be used of bringing them into contact with their own kind, but of slightly different ovoidity; and this, I believe, is just what the institute sets out to do. It does involve good libraries, which the institute has; agreeable—indeed beautiful—surroundings which the institute has just opened; and it does involve an approach towards the merging of attainments, which is one of the institute's main aims."

Final speaker of the evening was Vice Admiral N. E. Dalton, CB, OBE, engineer-in-chief of the fleet, who spoke of the problems faced by the navy in fueling and lubricating its vessels. He reviewed the storage requirements of the navy, and spoke of the necessity for ready pumpability of fuels under various climatic conditions. He mentioned that the navy uses oils from all parts of the world and must be concerned with compatibility as well as the usual problems of emulsification, high heat release, and storage stability. He paid tribute to the spirit of cooperation which has existed between members of the institute and the Admiralty Fuels and Lubricant Committee.

END



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WORLD TANKER FLEET

(Continued from page 43)

high-viscosity oil. Nevertheless, for ships over 30,000 dwt, oil companies in general maintain an overwhelming preference for turbines—283 of the 336 they now have on order being of this type. Of the balance of 53 motorships, only 19 have a tonnage in excess of 20,000 tons.

Meanwhile increasing attention is being paid to new methods of propulsion, especially as regards atomic energy. One Swedish builder has gone so far as to say that the last of the 65,000-ton commercial vessels recently ordered will be equipped with nuclear propulsion. But, as has been pointed out by John I. Jacobs & Co., it is one thing to design and build an experimental ship where capital and operating costs are a secondary consideration, but quite another to turn this into a commercial proposition. As already mentioned, the advent of the atomic tanker may be predicted as a certainty, but no one could forecast how long it would be before such a vessel would be competitive.

It should be noted, however, that the Atomic Energy Authority in Great Britain is considering three main methods by which nuclear power could be applied to the propulsion of merchant ships. One possibility would be a scaled-down version of the gas-cooled graphite-moderated Calder Hall type of reactor. The two most likely alternatives are seen as gas-cooled heavy-water-moderated or organic-liquid-moderated reactors. Which of these is given priority for fuller study depends on the prospects it offers for bringing the costs of nuclear-ship propulsion in line with those of the oil-fueled plant. At present, oil fuel costs are about 0.5 pence (0.58¢) per shaft horsepower-hour. Nuclear fuel costs well below this are obtained with the Calder Hall type reactors using natural uranium, a comparatively cheap nuclear fuel. Adapted for marine use, these might well prove a practical proposition for very large ships, such as big oil tankers, spending most of their working life at sea. Smaller vessels would probably require different reactor systems. One type, moderated by an organic liquid, could be built in small sizes to give outputs of 20,000 shp or less. The use of an organic liquid, such as hydrocarbon diphenyl or other polyphenyls, minimizes corrosion and also lessens the absorption of radioactivity, so that anti-radiation shielding of the external heat exchangers can be greatly reduced or even eliminated. This type of reactor, however, calls for an enriched fuel which is considerably more expensive than natural uranium.

While on the subject of tanker operations, it is worth giving some consideration to the relative merits of cathodic protection and painting as a means of retarding corrosion, a question which is still being argued from an economic standpoint. One of the major advantages of cathodic protection is that the more aggressive the environment, the more effective is the protection. Though paints of good resistance to oil are not particularly expensive, an obstacle to their satisfactory application to cargo tanks has been the difficulty and expense of previously removing all traces of mill scale. It has been calculated that over a 12-year period—at the age when a vessel would undergo an exhaustive survey for wastage of material—the total cost of cathodic protection would be less than half that of painting. Moreover, it has long been common practice, in calculating plate thicknesses for ships, to allow a margin for corrosion wastage. Designers now recognize that this may no longer be necessary with cathodic protection, which could thus lead to significant capital savings.

Having traced the history of the world's tanker fleet chronologically during the past 12 months, and the resulting vagaries of the charter market, it is instructive to re-assess the present position. At the end of January, it was safe to say that no oil tanker, however modern, could make a profit at the freight levels then ruling. The lowest rate at which a modern 19,000-ton tanker could operate profitably on the Persian Gulf to Western Europe route would be about 33s. 3d. ($4.75) per ton. Even a supertanker of 30,000 tons would need at least 28s. 6d. ($4.00) per ton. Even where tanker owners are prepared to accept such unprofitable business, they are finding it difficult to obtain employment; for not only have major companies reduced their chartering activities, but they have been offering some of their own tankers for re-letting. It is not surprising, therefore, that tankers are being laid up throughout the world in increasing numbers. The opinion has been expressed in some shipping circles that the total laid up may tend towards 4 million tons by the middle of the year unless there is a major revival in freights, and that many shipowners may consider cancelling their yard contracts and be willing to accept a 10% forfeit. Even on a long-term basis, independent owners are likely to be reviewing their fleet programs. An OEEC report last year suggested that, while oil consumption over the next few years is expected to expand at the rate of about 7% per annum, the growth of the world tanker fleet will be considerably greater over the same period. There could thus be a large surplus of oil tankers in the world by the early 1960's, even with oil consumption growing as expected. It is significant to add that an important new entrant to tanker operation is the Peninsular and Oriental Steam Navigation group, which in 1955 decided to build a tanker fleet at a cost of some £37 million. Unconfirmed reports now suggest that no more than 5 of the 18 ships envisaged have actually been ordered. If this is true, P. & O. would seem to have had second thoughts.

The financing of the major oil companies is always a matter of importance, since they are committed to programs of continual expansion for oil exploration and development as well as for tanker building. "Shell" raised £30 million a year ago for the purchase of tankers by the following procedure: A new company, Tanker Finance Ltd., was formed which borrowed the required capital, one-quarter from Lloyds Bank and the remainder from institutions —thus effecting what has been called a marriage of convenience between the two types of investor. The loan is secured by a mortgage on the vessels which will be hired from Tanker Finance Ltd. and operated by Shell on a bare-boat charter for 24 years. At the end of this period, the ships will revert to Shell. This financial arrangement received the consent of the Capital Issues Committee. Somewhat similar arrangements were made for financing £40 million worth of new tankers for British Petroleum Co. Ltd. A new company, Tanker Charter Co. Ltd., was formed to borrow this sum on the security of the tankers under construction for B.P. Tanker Co. Ltd., which it will purchase on their completion. These tankers will be chartered to B.P. Tanker Co. Ltd. on terms calculated to cover loan interest and retirement over 23 years, at the expiration of which the tankers revert to B.P. Tanker Co. Ltd. Of this £40 million, the banks advanced £15 million; the remainder was placed with institutional investors. Later, in December (1957), British Petroleum Co. made an issue of £41 million 6% convertible debenture stock which was described in the press as "one of the most successful debenture issues ever." It was oversubscribed more than 16 times.

In the United States and on the continent, finance is still available in the form of loans from banking houses; but in the United Kingdom the credit squeeze is now limiting such facilities, as the Capital Issues Committee frowns on banks lending short-term money, while institutions such as insurance companies seek a longer term investment at the high rates of interest now ruling.

In reviewing all which has occurred in the past 12 to 14 months, and making full allowance for the temporary (very natural) alarm occasioned by the Suez incident, the final assessment must undoubtedly in the long term be one of optimism. United international action insured a very adequate supply of oil for Western Europe, so that the closing of the canal did not prove to be the major catastrophe which had been imagined. And when, in spite of the present surplus of tankers, the major oil companies are investing many millions in tankers to be delivered from two to five years ahead, there could hardly be a clearer indication of confidence in the future. In other words, nothing can for long hold up the progress of the world—with which, in the nature of things, the oil industry is intimately bound up.

Acknowledgment is made to the following sources of information in the preparation of this article: The Shell Petroleum Co.; British Petroleum Co.; *Lloyd's Register of Shipbuilding Returns;* John I. Jacobs & Co.; Davies and Newman; *The Financial Times.*

END

J. E. Swearingen

New S. O. Indiana Chairman and President

Frank O. Prior has been elected chairman and chief executive officer of Standard Oil Co. (Indiana), Chicago, and John E. Swearingen president—following the retirement of Robert E. Wilson, chairman for 13 years. Mr. Prior has been president since 1955; Mr. Swearingen has been an executive vice president since 1956.

Additional responsibilities, largely in the coordination of activities with some of the company's major subsidiaries, have been given to Robert C. Gunness, also an executive vice president since 1956. George V. Meyers, general manager of production, has been elected vice president for production.

F. O. Prior

Plastic Pipe

Kraloy Plastic Pipe Co. Inc., Los Angeles, has prepared a brochure describing applications for extruded plastic pipe in the petroleum industry. The Kraloy rigid polyvinyl-chloride plastic pipe is laid with solvent-welded joints which eliminate leakage and resist paraffin buildup. Pipe is resistant to sour-crude corrosion; is not affected by electrolysis; and resists scale in salt-water lines. Data on working pressures, sizes, and physical characteristics are included in the brochure, which is available on request.

Papers Submitted to 5th World Petroleum Congress

Offers of papers detailing advances in the international oil industry already exceed the 250 which it is expected will be given at the Fifth World Petroleum Congress in New York in June 1959.

Papers by USA authors are being selected by a committee under the chairmanship of J. K. Roberts, director and vice president of Standard Oil Co. (Indiana). Mr. Roberts is also chairman of the Congress' Program Coordination Committee which is responsible for the final overall selection of papers on a worldwide basis. The USA National Committee members and the subjects for which they have invited papers are: Dr. H. D. Hedberg, vice president, Gulf Oil Corp. (Geology and Geophysics); Harold Decker, president, Highland Oil Co., Houston, (Drilling and Production); C. K. Viland, general supervisor, research and development, Tidewater Oil Co., (Oil Processes and Refining); Dr. J. Q. Cope, assistant general manager, Richmond Laboratories, California Research Corp., (Chemicals from Petroleum and Natural Gas); Harry Levin, assistant to manager, research and development division, The Texas Co., (Compositions; Analysis, and Testing); A. J. Blackwood, assistant director, products research division, Esso Research and Engineering Co., (Utilization of Oil Products); S. D. Dalton, assistant general manager, manufacturing, Socony Mobil Oil Co. Inc., (Engineering, Equipment, and Materials); D. B. Hodges, vice president, transportation and supplies, Shell Oil Co., (Transportation and Distribution); and J. W. Boatwright, chief economist, Standard Oil Co., (Indiana), (Operations Research, Statistics, and Education).

Dr. R. L. Doan, manager, atomic-energy division, Phillips Petroleum Co., is organizing the United States' participation in a symposium on the applications of atomic energy to the petroleum industry.

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WASHINGTON PIPE LINE

(Continued from page 5)

state of Tachira—all in Venezuela," he said.

The company owns a 30% interest in, and is operator of, 2,000 acres in Lake Maracaibo, on which three wells have been completed with an aggregate producing potential in excess of 10,000 b/d. Seven additional wells are planned for the remainder of the calendar year. It also owns a 30% interest in a concession of approximately 25,000 acres.

Phillips Petroleum Co. is operator of a 25,000-acre block in which San Jacinto has a 25% interest. One well has been completed with a producing capacity of 4,000 b/d, and seven additional wells are budgeted for the remainder of the year. The company also owns an 8⅓% interest in three concessions in the state of Tachira, comprising approximately 74,000 acres, on which geophysical work is to be performed during this year. The company's investment in Venezuela stands at $17,350,000, and its share of budgeted expenses for the current year is $5 million. The company has 4,100 b/d of the Venezuelan production net to its interest, and expects this "will increase during the year to a potential of at least 14,000 b/d.

C. Z. Hardwick, executive vice president of The Ohio Oil Co., said Ohio expects to have 6,000 b/d of crude from its 25% share of an operation on 150,000 acres in the Gulf of Paria, betwen Venezuela and Trinidad. Ohio's interest cost more than $26 million, he said. Three other companies are in the venture. Ohio has spent $30 million for oil development in Canada, and now has a net production of 5,000 b/d. All told, he said, Ohio has spent $75 million for foreign operations in the past 10 years, and only has the Canadian production to show for it.

Russell Marks, vice president of Murphy Corp., El Dorado, Ark., said some $5,400,000 will be spent through May of this year on additional work on a Lake Maracaibo concession of which Murphy owns 15%. Ultimately, he said, Murphy may spend $7 million on this concession. Through January, Murphy's share of the cost was $2,559,000. By the end of May, he said, the company's 15% share of the production from the Lake Maracaibo concessions is expected to be 2,000 to 3,000 b/d.

Murphy also has 15% of a 900,000-acre concession in Bolivia, acquired July 1957. Some $4,700,000 has been spent on the concession, and $6,200,000 is to be spent this year. A well is being drilled, and preliminary information indicates commercial production from it, he said.

K. A. Covell, vice president of The Pure Oil Co., said the company has a share of oil leases and concessions covering 20,241,197 gross acres in six countries of the Western Hemisphere outside the USA. The details:

Country	*Gross Acres*	*% Owned by Pure*
Bolivia	1,232,310	33⅓
Canada	1,230,924	50
Colombia	1,227,714	20
Guatemala	1,597,796	19½
Paraguay	14,826,000	30
Venezuela	126,453	25
Total	20,241,197	

Development programs or commitments in 1958 on concessions call for drilling three wells in Colombia, two in Paraguay, two in Canada, and 12 in Lake Maracaibo, where production has been obtained he reported.

Talon Petroleum CA—owned 51% by US interests and 49% by Venezuelan—expects to have 5,000 b/d crude production in the state of Falcon, Venezuela, by the end of this year. Aggressive drilling is planned. Cecil V. Hagen, president, said the company had production of 890 b/d, December 1, 1952, when it took over operations of British Controlled Oilfields Ltd., in Venezuela. Three fields were involved: El Mene, Media, and Hombre Pintado. Production reached 3,600 b/d at the end of 1956. Now it is 2,000 b/d.

Depletion Opposition Strong

Senators opposed to the 27½% depletion allowance for crude and natural-gas production say they are stronger than ever before. Senator John J. Williams (R., Del.) claims enough senators are in favor of his measure to cut the allowance to 15% to force a roll-call vote. He plans to offer his measure as an amendment to the first appropriate tax bill which comes before the Senate.

Displeases Oil Leaders

Secretary of the Interior Fred A. Seaton is displaying an independence in the way he handles petroleum matters. Few of his recent actions please oil and gas leaders. The secretary told the National Petroleum Council to accept a government official as chairman. He asked the resignation of Hugh A. Stewart, ex-Texaco, as director of Interior's Office of Oil and Gas, and picked Gordon Guiberson, of Dallas, for the spot—but without checking with oil and gas leaders. Later, he changed his mind on naming Guiberson, but has changed the post from civil service to patronage, to make it easier for him to put in his own man. He has also shifted Connally act enforcement to US Geological Survey. Signs are, the office will become a small policy unit under the secretary.

Finally, the secretary ignored most views of oil and gas leaders in adopting rules covering leasing of oil and gas, on wildlife refuges and other public lands. The secretary did allow, however, continued oil operations in the Kenai Moose range in Alaska.

Mississippi Refinery Onstream

Pontiac Eastern Corp. now is operating its Black Creek refinery built near Purvis, Miss., to process heavy crude produced in that area. The 14,500-bbl. plant represents an investment of $20 million.

Heavy crude for the refinery is charged to a tar separator, from which heavy ends are sent to a fluid coker and tops to a TCC unit. The plant also processes field distillate which is catalytically reformed in a Platformer. An alkylation unit and Unifiner make up the remaining principal processing units.

Gulf Oil Corp. supplies crude for the plant and markets the gasoline through its nearby stations.

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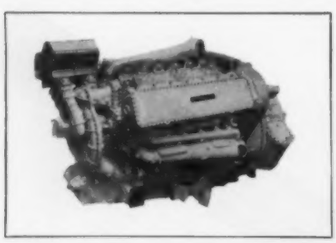

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The boat illustrated is one of the fleet of Thornycroft-built, twin Deltic powered, 50-passenger crew launches operated by the Shell Petroleum Company on Lake Maracaibo. Plans of Deltic powered crew boats suitable for Gulf operation are available.

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EP Drilling-Fluid Additives Cut Bit and Pipe Wear

Gulf Oil Corp. has announced a development which may reduce drilling time in deep wells by 12½% to 25%.

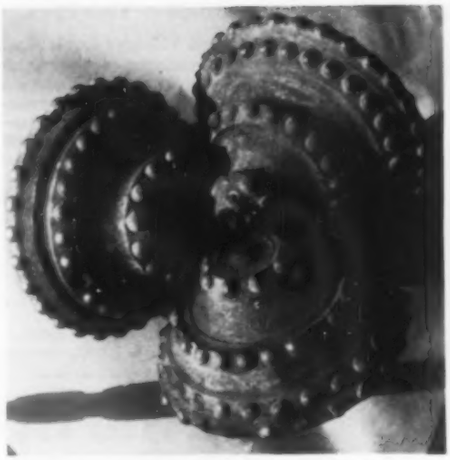
The company has created drilling muds with extreme-pressure lubricating properties, which lubricate drill-bit bearings and the entire drill hole. The result is to increase the life of drill bits by two to five times, on the evidence of research and field trials; and to reduce, to an equal extent, the round-trips for changing bits which, in deeper wells, account for 20% to 40% of rig time.

The number of drill bits per well may be cut in half or more. The wear on costly drill pipe and on the drilling rig will be reduced, due to less frequent round-trips. Lost tools and pipe are more easily recovered due to less friction. Drill-pipe rotating torque measured on several test wells using the lubricating additive in the mud dropped as low as one-twentieth of that with conventional muds.

Application has been made for comprehensive patents covering the Gulf development. The company will, however, share the benefits with the industry through licensing to mud service organizations. Amounts of the extreme-pressure lubricant additive used in the mud to obtain the above results are relatively small and inexpensive, it was stated.

Some 3,600 test runs of mud formulations were made on this machine, with results exceeding the expectations of the researchers. Conventional oil-emulsion mud showed only minor lubricating quality on the machine; but, when EP additives were introduced, the load-carrying characteristics of the resulting mud mixture rose to surprisingly high values.

A few of the specific pilot-test results follow: Conventional oil-emulsion mud, 20 life hours; with EP., 60 life hours. Conventional 6% bentonite mud, 10 hours; with EP., 55 hours. Conventional clay and water, 15 hours; with EP., 65 hours. Conventional weighted mud, 11.5 lb per gal., 38 hours; with EP., 78 hours.



Gulf had more than twice the penetration with bit on right—which ran until almost smooth when EP additives were added to drilling fluid—while bearings locked on the non-EP-lubricated bit (left) before its cutting potential was half used. Total footage made by bit at left was 504 ft; by bit at right 1,198 ft. Both are 8¾ chert bits run with 35,000 lb weight on bit at 35 rpm.

In a comparative field test in West Texas, a bit with a conventional mud ran 17¾ hours and made 344 ft before failure; while, in a similar formation nearby, the same type bit with the same mud plus EP additives, ran 41 hours and made 915 ft.

Controls Division Moves Plant

Industrial Controls Division of Manning, Maxwell & Moore Inc., manufacturer of electronic instruments for measurement, transmission, and control of process variables, has moved its offices and manufacturing facilities from the company's Stratford, Conn., plant to a new plant in Danbury, Conn.

Chloride-Free Paraffin Removers

Under the tradename SOLVO®, Tretolite Co. Divisions of Petrolite Corp., of St. Louis and Los Angeles, has introduced new parffin removers which are free of organic chlorides. They are organic liquids, most of which are dispersible in both oil and water, and can, therefore, be used in either diluent.

SOLVO paraffin removers can be used as both correctives and preventives. They are effective when used to remove paraffin deposits from pumping and flowing wells, flow lines, pipelines, or storage tanks. When applied to clean, paraffin-free systems they prevent paraffin deposition.

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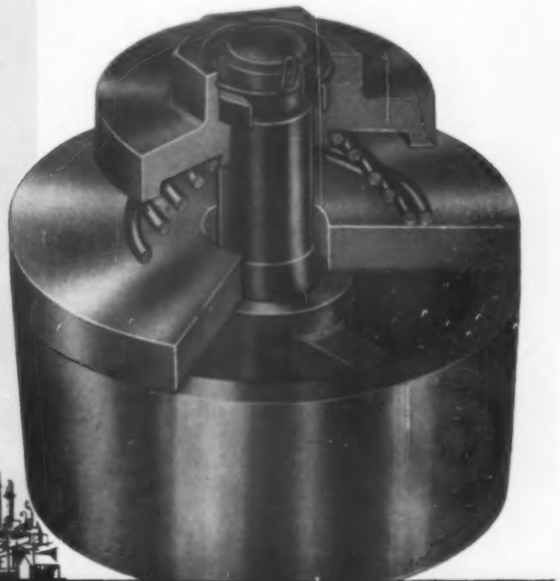

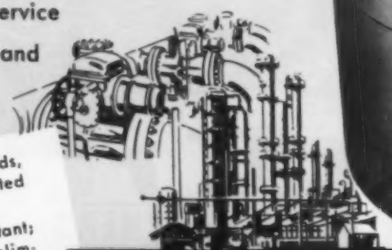

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Charles O. Bartley

Bartley Elected Mission Vice Pres.

Charles O. Bartley, works manager for Mission Manufacturing Co. has been elected vice president in charge of engineering and manufacturing and a director. Mr. Bartley joined Mission after his graduation from Rice Institute with a degree in mechanical engineering. He served in the Navy from 1943 through 1946, during which period he taught marine engineering at the U. S. Naval Academy. After returning to Mission he became schedule department supervisor and later production superintendent and has been works manager since 1954.

Marks Heads Hercules

Arthur D. Marks, manager of the foreign division of Hercules Motors Corp. since 1945, and a former Navy career officer, has been named director of sales.

The "Julie Ann" built by R. G. LeTourneau, Inc., of Longview, Texas, for Dixilyn Drilling Corp.

Portable Platform for Deep Water

The "Julie Ann" portable drilling platform built by R. G. LeTourneau, Inc. for Dixilyn Drilling Corp., Odessa, Texas, is equipped with 175-foot legs which will permit it to drill in water of 100 ft depth or more. Because of special derrick design it can drill six holes without being moved. Designed for quick moves the platform can be raised or lowered at the rate of a foot per minute. Legs may be moved independently for leveling purposes.

Packaged drilling equipment was assembled by White Motor Co. consisting of three White Superior 834 hp diesels to deliver 2,000 hp through the National drawworks or to mud pumps. Diesels are direct connected to Westinghouse generators which supply energy for two 1250 White-Westinghouse motors on the drawworks. A Halliburton cementing unit with storage for 1700 sacks is built into the platform which contains crew living quarters and has deck space for storing 25,000 feet of drill pipe. The 140 ft derrick has a 30 x 40 ft base and a 525-ton crown block. The entire unit may be skidded on a massive pair of tracks.

Offshore Flare Gas Disposal

Waste gas from offshore oil wells in the Gulf of Mexico is now carried off by flexible, rubber-covered hose that drapes to the ocean floor as it carries the gas hundreds of feet from the oil rig to where it can be safely flared. About 400 feet of hose, with an inside diameter of 3 or 4 inches, links the oil rig with an anchored flare buoy. The hose is made by United States Rubber Co. in 50-foot lengths. It has a special, high-tensile cord carcass for strength, and is covered with corrosion-resistant neoprene rubber. The rubber even covers metal connecting joints to protect them from salt water.

Ideco Foreign Representatives

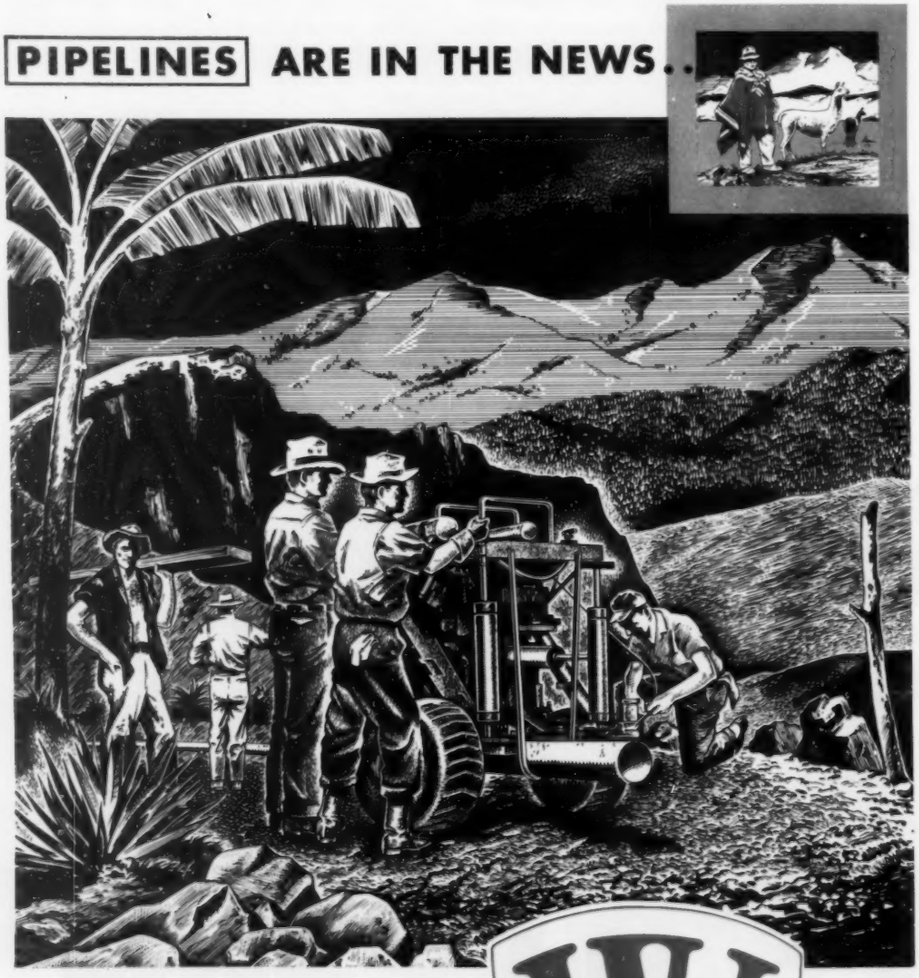
Ideco, Inc., and its affiliates Dresser A. G. and Dresser International, Inc., have announced the appointment of two executive foreign representatives for Ideco products. Georges Cance has been named European manager for Ideco products with Societe Francaise des Industries Dresser, S.A., Paris. W. L. Farrow has been appointed director of South American operations for the Ideco with offices in St. Augustine, Trinidad. He was formerly managing director of EDECO (Trinidad) Ltd., a subsidiary of English Drilling and Equipment Co.

Organizes Venezuela Subsidiary

BS&B International, S.A., a wholly-owned subsidiary of Black, Sivalls & Bryson, Inc., has established a Venezuelan division with offices at Caracas, Maracaibo and Anaco.

Allen Pike, formerly of Oilfield Sales and Service, S.A., exclusive representatives for BS&B oilfield equipment in Venezuela since 1952, has been appointed manager of the newly-created division with headquarters at Caracas. Eugene L. Seale has been appointed manager of the Anaco branch which will serve Eastern Venezuela and James H. Clayton has been appointed manager of the Maracaibo Branch which will serve Western Venezuela.

PIPELINES ARE IN THE NEWS..



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Neutral Zone Offshore Line

Collins Construction Co., of Port Lavaca, Texas, has been awarded the contract for installation of a 24-in. crude sea-loading line in the Persian Gulf by American Independent Oil Co. of San Francisco.

The concrete-coated steel pipeline will originate at American Independent storage facilities onshore at Kuwait, and will terminate some 16,000 ft offshore. Tanker mooring facilities will be constructed by Collins at that point. A 12-in. bunker line, to be laid parallel to the crude line, is also included in the contract.

Work is expected to be completed by March 30. Fred O. Wakefield will be general superintendent for Collins in charge of the project.

Estimate USA Gas Over 1,200 Trillion Cubic Feet

The natural-gas supply "recoverable from presently proved reserves and from future discoveries in the United States, including offshore production, will exceed 1,200 trillion cubic feet," according to "Future Growth of the Natural-Gas Industry," a paper by L. F. Terry and J. G. Winger, at the recent AIME meeting.

Sulfur-Recovery Unit

Tears Engineers, Dallas, has issued a four-page bulletin on its new portable sulfur-recovery unit licensed by Pan American Petroleum Corp.

Texaco Exploration Staff Changes

Following staff changes have been announced by S. A. Berthiaume, vice president and manager of Texaco Exploration Co.: Bland M. Woofter has been appointed chief petroleum engineer—replacing Tom Gaines, recently transferred to Texas Petroleum Co., Bogota, Colombia; George S. Horne staff petroleum engineer, with headquarters at Calgary, Canada.

Lucey to Represent Tube-Kote

Lucey Export Corp., of New York, has been named export sales representative for Tube-Kote Inc., Houston, in Brazil and Argentina. Lucey's representative in Rio de Janeiro is Oscar Bernardes.

to all NATURAL GASOLINE MEN

GREETINGS

from the

NATURAL GASOLINE SUPPLY MEN'S ASSOCIATION

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The Garlock Packing Company
Gas Equipment Co., Inc.
Gasoline Plant Construction Corp.
General American Transportation Corp.
General Electric Company
J. B. Gill Company, Inc.
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Graver Tank & Mfg. Co., Inc.
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D. W. Haering and Co., Inc.
Hammel-Dahl Company
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Hercules-Lupfer Engine Sales Company
Hubbard Electric Company
T. F. Hudgins & Associates, Inc.
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Manzel, Inc.
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The Marsh Company
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Lynn McGuffy Company
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Nickles Machine Corporation
Nitrogen Division Allied Chemical & Dye Corp.
Nordstrom Valve Div., Rockwell Mfg. Co.
Wm. W. Nugent & Co., Inc.
Nutter Engineering Co.
The Ohio Injector Co.
The Oil & Gas Journal
The Oil Daily
Oil Well Supply Div., U. S. Steel Corp.
Olin Mathieson Chemical Corp.
O. L. Olsen Company
Orbit Valve Company
Pacific Pumps, Inc.
Paramount Supply Company
Peerless Mfg. Co.
Perry Equipment Corp.
Petro-Chem Development Co., Inc.
Petrocon Engineering Co.
The Petroleum Engineer
Petroleum Refiner
Petroleum Week
Phelps Dodge Copper Products Corp.
Pierce Construction Co.
Pittsburgh Div.—Rockwell Mfg. Co.
Plibrico Company
Podbielniak, Inc.
Pono Engineers, Inc.
Power Machinery Co.
Power Specialty Co.
J. F. Pritchard & Co.
Process Equipment Co.
Procon, Inc.
Puffer-Sweiven, Inc.
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Rawson and Company
The Refinery Supply Company
Riddle and Hubbell
Robinson Orifice Fitting Co.
Rockwood Sprinkler Company
Rogers Steel Corp.
E. W. Saybolt & Company
A. O. Smith Corporation
Smithco Engineering, Inc.
Snyder Company, Inc.
Southern Engine & Pump Co.
Southern Petroleum Laboratories
Southwest Industries, Inc.
Stearns-Roger Mfg. Co.
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Western Chemical Co., of K. C., Mo.
Western Chemical & Supply Co.
Western Supply Company
The Wickes Boiler Co.
Wilson Supply Co.
Wolverine Tube Division
Woobank Machinery Co.
World Petroleum
Worthington Corporation
Wright Chemical Corporation
Wyatt Metal & Boiler Works
John Zink Burner Company

Pipeline Diesels

Bulletin #116, a brief summary of the company's line of Superior diesel, gas, and dual-fuel engines with applications in the petroleum pipeline industry, has been issued by the White Diesel Engine division of The White Motor Co., Springfield, Ohio. Ranging from 190 to 2,150 bhp, the units can be furnished to run as diesel, dual-fuel, or gas engines, and they are also available in engine-generator sets of from 150 to 1,500 kw.

Brown Opens Dallas Branch

"Jug" Davis has joined the Brown Oil Tool Co. as a sales engineer and has established a Brown service and administrative office in Dallas to serve the Dallas-Fort Worth area. Before joining Brown Mr. Davis was associated with a major oil company for 10 years as a engineer.

High Pressure Tubing

Grayloc tubing, a specialty oil country product capable of withstanding the conditions found in the highest pressure wells, is now being made by Jones & Laughlin Steel Corp. under a licensing agreement with the Gray Tool Co., Houston. Grayloc tubing features an effective high pressure seal which has previously been used extensively for connections on well head equipment. Its application on tubing is designed to meet the increasing demands of deeper wells and the tapping of formations with ever greater pressures.

Telemetering System Viewer

"In Line" reading for Vapor Recovery Systems Co. pulse code liquid level & temperature telemetering systems is now available with data viewed from an image optically projected directly onto ground glass located at the front of the receiver. Numbers are clearly visible from an oblique angle and the viewer does not have to stand directly in front of the receiver.

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Expands European Operation

Reece Hatchitt, president of Dresser A. G., European affiliate of Dresser Industries, Inc., announces that the expansion of the firm's SIE division. SIE (Southwestern Industrial Electronics) is a manufacturer of electronic equipment and instrument systems.

Chris Ring, formerly with SIE at Houston, has been appointed manager of the division and William N. Reese, has been placed in charge of technical services.

Super Lift Hoist

A new super-lift hoist has just been designed and built by R. G. LeTourneau, Inc., of Longview, Texas. The hoist has a capacity of 45 tons and has a lift height of 103 ft.

Heide Platformer Onstream

A combination UOP Platforming-Unifining unit, which includes gas concentration facilities for producing LPG, has gone on stream at the refinery of Deutsche Erdol-Aktiengesellschaft at Heide, Germany. The unit is designed to handle blends of Heide-Arabian crudes boiling. The Unifining unit is serving as a pretreater for the Platformer, which is designed to produce a 95 F-1 clear octane blending component. Initially operating at a capacity of 2,000 b/sd. the Platformer eventually will be operated at twice that rate. The Platformer is the sixth operating in Germany. It was constructed by Procon (Great Britain) Ltd., in cooperation with Edeleanu Gesellschaft m.b.H., Frankfurt/Main, and was designed, engineered, and licensed by Universal Oil Products Co.

Schlumberger Appointments

Seven new field assignments have been announced by the Schlumberger Well Surveying Corp., Houston, as follows: F. E. Kendrick, sales engineer, Laurel, Miss.; P. H. Hines, division engineer, Farmington, N.M.; Jan Maraman, sales engineer, Wichita Falls, Texas; E. A. Colle, assist. mgr. Mid-Continent area, Tulsa; R. E. Hamilton, senior sales engineer, Midland, Texas; and V. J. Davis, sales engineer, Wichita Falls, Texas.

Buys Velocity Loggers

Seismograph Service Corp., Tulsa, has purchased three velocity logging units from Magnolia Petroleum Co., bringing to 11 the total number of units operated domestically by SSC. Also purchased was a specially designed analog computer to handle CVL data.

Since 1954 SSC has produced 27 CVL units, and in addition to the 11 which the company operates in the United States, its foreign subsidiaries are conducting logging activities in Canada, Venezuela, Colombia, Cuba and in Sicily and North Africa.

International Exposition Housing Bureau Open

Housing bureau for 1959 International Petroleum Exposition, Tulsa, Okla., has been set up with George Billingsley as manager. Applications for accommodations are being received at Oil Capital Bldg., 507 South Main St., Tulsa.

New UOP Petroleum Inhibitor

The development and commercial availability of a new, multi-purpose dispersant inhibitor for petroleum products has been announced by Universal Oil Products Co. Bearing the trade name, POLYFLO 100, the new dispersant has also proved potent in minimizing deposits and stabilizing color in diesel oils, distillate burner oils, and residual fuels. Depending upon the application, from 5 lb to 15 lb of the additive is required to treat 1,000 bbl of product. Applied to refinery streams, the new additive prevents deposition and fouling in heat exchangers and reboilers. Crude-oil and residual fuel-oil tanks and transfer equipment may be kept free of sediment and waxy deposits with Polyflo 100.

William E. Ridgeway

Joins Lebanon Supply Firm

William E. Ridgeway has joined the K. L. Bourdo oil field supply and service organization in Beirut, Lebanon. The Bourdo company represents Ideco products in the Middle East, Near East and Northeast Africa. Mr. Ridgeway has been senior drilling engineer for Kuwait Oil Co., an affiliate of Gulf Oil Corp., for the past two years. Prior to that he worked in Gulf's Tulsa Drilling Engineering Division, and as a drilling foreman on various wildcat drilling projects in Montana and Wyoming.

Offshore floater hose assembly demonstrated recently by Quaker Rubber in Philadelphia. While under pressure this 250 foot length of discharge hose is supported by the pontoons as shown in the above photo. The pontoons allow the hose to be slightly submerged and eliminates the use of bulky oil drums.

Offshore Floater Hose

A new offshore floater hose assembly has been designed by the Quaker Rubber Division, H. K. Porter Company, Inc., for loading and unloading tankers offshore. The assembly was designed to save time, to prevent losses through costly replacement of hose and to help prevent accidents. The floater hose has valuable application for the transfer of oil and fuel at offshore drilling installations as well as ship to shore.

The complete floater hose assembly is made up of three components. The first is the 250-foot continuous lengths of discharge hose that can be reeled in and out. The nylon reinforced hose itself is constructed of synthetic compounds to resist oil and salt water.

The second component is a reel that houses the discharge hose. The reel is coated to protect against salt air and prevent unnecessary abrasion to the hose while it is being unreeled. Steel rollers placed in front of the reel prevent scuffing against the dock. The reel can be mechanized for automatic operation.

The third and most revolutionary development is the pontoon. It is a rectangular rubber balloon that measures 19 feet, four inches long when inflated. The pontoons are inflated with air and are attached to the hose with quick acting fittings as the hose leaves the reel eliminating the conventional method of coupling the 50 foot lengths of hose and attaching bulky oil drums.

Pontoon intervals, depend on the size of the hose and the weight of the fluid being conveyed, and ride vertically with the hose. This allows the hose to be slightly submerged and the pontoons to adjust their position as wind, tide and current may dictate, while loading and unloading operations continue uninterrupted.

Spanish Petrolite Brochure

A colorful new brochure has been prepared by the Petrolite Corp. especially for Latin American distribution. It sets forth, in Spanish, the company's story of products, processes and services for the petroleum industry as provided by its Tretolite and Petreco divisions in the fields of demulsification, desalting, electrofining and corrosion inhibition. Flow diagrams and installation photos are included. A free copy of the brochure is available on request. Address the Petrolite Corp., 369 Marshall Ave., St. Louis 19, Mo.

Deck Crane

A new all-electric deck crane is described in a two-color folder just released by R. G. LeTourneau, Inc., of Longview, Texas. The crane features positive load control for capacities up to 25 tons. It is recommended for use aboard marine craft, docks, or other locations wher constant lifting is required within a prescribed area.

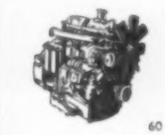
Electric Tachometers

Recent technical improvements in *Martin-Decker's* line of Electric Tachometers are included in the newly revised brochure P-74. These self-energizing instruments are for the measurement of pump-stroke count, rotary table speed and engine rpm and are considered a major improvement over the mechanical tachometers used by the drilling industry for many years.

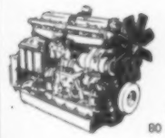
SPECIFY

ROLLS-ROYCE Diesels

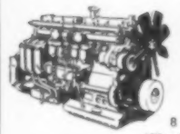
The suitability of Rolls-Royce diesels for a wide variety of installations is proved by the fact that a dozen of the world's leading Oil Companies in South America, Trinidad, Iraq, Kuwait, and Borneo are placing orders for Rolls-Royce powered equipment. Oweco National and Woodfield Hoist Ideco are using Rolls-Royce diesels in work-over hoists, service drilling rigs and sludge pumps. On Lake Maracaibo Shell are operating over seventy Rolls-Royce diesels in high speed launches and workboats, in addition to a large number in Coles Cranes, Consolidated Pneumatic Compressors, Scammell Trucks and Petbow Generators.



4 Cylinder
60 - 200 b.h.p.



6 Cylinder
80 - 300 b.h.p.



8 Cylinder
100 - 400 b.h.p.

Pulsometer Pump

Dawson and Downie Pump

Oweco National Drilling Rig

Woodfield Swabbing Unit

Consolidated Pneumatic 365 - R.O.2

Petbow 182 k.w. Generator

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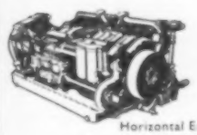
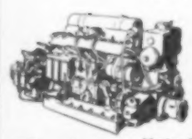
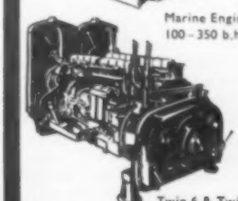


Horizontal Engines
100 - 400 b.h.p.



Marine Engines
100 - 350 b.h.p.



Twin 6 & Twin 8
Power Packs up to 600 b.h.p.

International News and Notes

E. Ospina-Racines, president of Colombian Petroleum Inst., at dinner commemorating 50th anniversary of Colombia's oil industry.

Colombian Institute Celebrates Oil's Golden Jubilee

The Colombian Petroleum Inst. held a banquet and meeting in Bogota, February 7 last, to commemorate the 50th anniversary of the oil industry of Colombia. The first wildcatting took place in Colombia in 1907—likewise in Argentina where the 50th anniversary is also being celebrated. Today Colombia has an oil output of 130,000 b/d and Argentina 90,000 b/d. President of the institute, E. Ospina-Racines, made the address of the evening —with some 200 members and guests attending.

Under the oil legislation of 1931 to December 31, 1957, a total of 219 concessions had been granted. Of these, 5% have proved commercial; and there are 111 being explored and 97 surrendered. The oil policy of Colombia since 1931 has resulted in 96,400 b/d of oil of the current total. In 50 years a total of 344 exploratory wells have been drilled in Colombia—finding 38 oil pools, of which 23 are now producing from less than 150 b/d to 30,000 b/d. A total of 1.5 billion barrels of oil have been proved, of which 790 million have been produced and 710 million are today's oil reserves. The deepest wildcat drilled to date—by Richmond (Standard of California)—reached 15,539 ft, cost $2 million, and was dry.

After 50 years of development, the Colombian oil industry is the second oil exporter of South America after Venezuela.

Colombia's oil progress has been slower than in some other nations because of the great inland distances of its oil fields from tidewater—the four principal ones are located at 540, 455, 600 kilometers from the Caribbean and the Llanos area. 50% of Colombia's prospective oil land is located at more than 1,000 km from the Caribbean. These distances are comparable to the ones for the oil fields of Bolivia.

Although relatively small, the oil industry is most important in the country's economy. It is the second in value as exporter; for 1956 coffee brought $386 million and oil $71 million in exports—and of total dollar exchange, oil brought 6.3%, second to coffee. Oil output takes care of the country's 48,000 b/d consumption, and refining capacity is greater than consumption demand. Oil-industry investment is around $400 million. The oil industry obtains about 6% on its investment, and shares 50-50 with the government in the profits. The oil industry contributes about 5% of the total fiscal income yearly —unlike in Venezuela, where this percent is around 60% and the entire economy is geared to oil.

President of the CPIE Ospina-Racines made an appeal for stronger financing of the institute which could establish scholarships, issue educational publications, organize a library, and serve as medium to exchange ideas and information with similar institutes in other countries. He claimed the oil industry is overdue in promoting these activities on the part of the institute. He cited a number of individuals, Colombian and foreign, who had contributed and oriented the 50-year development of Colombian oil.

USSR Plans for 1958

Of the 98.3 million tons of crude produced in the Soviet Union in 1957, Russian Soviet Federated Socialist Republic (RSFSR) produced 74.5 million tons, i.e. 13.2 million tons more than in 1956. Output in 1958 is to increase by 17% to 86.7 million tons. Exploration drilling, which in 1957 was 21% more than in 1956, is to increase in 1958 by 26%. Areas of most intensive prospecting are Kuibyshev, Saratov, Krasnodar, Stavropol, Perm, Chkalov. During 1957, refining capacity was increased by 2 million tons. Several refineries are to be finished in the regions of Gorkiy, Stalingrad, and Perm during 1958.

Azerbaijan plans to produce, in 1958, 16,415,000 tons of crude, i.e. 440,000 tons more than in 1956. Gas production is to increase by 1.1 billion cubic meters to 4.5 billion cubic meters. Exploration and exploitation drilling in 1958 is to increase by 20% to 2,969,305 ft. Construction is to start of gas pipelines from Karadag to Kirovabad, from Akstafa to Tbilisi, and Akstafa to Yerevan.

Uzbekistan intends to complete the first section of the Fergana oil refinery at the end of 1958. Gas production is to increase by 50% compared with 1957. Several gas pipelines are to be completed.

Kazakhstan is to double its crude output during the period 1959 to 1965. Capital investment in 1958 is to increase by 59.2% over the previous years; 89% of investments are to be used for drilling of new wells and the reactivation of old wells, 11% for the construction of the Pavlodar oil refinery.

The Ukraine is to produce in 1960 seven times more liquid fuel than in 1957. In 1958, deep prospecting is to be intensified. Ten gas wells are to be drilled at the Rudki and Kosov gas fields. Oil refineries in Drogobych and Nadvornaya are to be enlarged and new refineries are to be built.

In the Far East, the Sakhalin oil trust is to increase, during the period 1959-65, crude production by 92% and gas production by nearly 90%.

1st Large-Scale Sahara Awards

Exploration permits totaling 28,600 sq km surrounding Hassi Messaoud have been awarded seven oil groups—each foreign company represented by a French affiliate. Awards in first large-scale entry of foreign interests in French Sahara include: (1) CPA (Dutch-Shell 65%): permits "Hassi Keskes" and "Oued Metlili" for 2,700 sq km, minimum investment 675 million French francs; (2) CREPS (Dutch-Shell 35%): permit "El Hobre," 2,700 sq km, minimum investment 675 million francs; (3) SVP (BP & French affiliate 50%): permit "Oued-Nsa," 4,600 sq km, minimum 1,150 million; (4) Phillips plus COPEFA & OMNIREX (Phillips's share 25%): permits "Hassi Houareg" and "El Morr," 3,300 sq km, minimum 925 million; (5) group comprising AFROPEC (Cities Service French affiliate) plus PREPA and FRANCAREP: permits "Hassi Melah," "Hassi el Hadjar," and "Oulougga," 6,400 sq km, 1,600 million; (6) SNPA: permit "El Barour," 7,700 sq km, 1,925 million (7) PETROSAREP: permit "Erg Foukani," 1,200 sq km, 300 million. Reportedly, 8th award will soon go to group comprising Newmont Mining, Sinclair Lazard Frères, Safrep Omnium de Caleurs Agricoles Industrielles et Minières.

Saudi Arabia Manifa's New Producing Zone

Drill-stem tests at Manifa No. 1, 120 northwest of Dhahran, Saudi Arabia, discovery well in the Arabian American Oil Co.'s second offshore field in the Persian Gulf, indicate possibility of oil in commercial quantities between the Zubar and Arab zones, according to company announcement. Indicated new producing zones are between 7,600 ft and 8,300 ft under the Gulf bed.

On a recent visit to the USA, Robert du Pasquier (right), president of Exploration Geophysique Rogers, French affiliate of Rogers Geophysical Co., checks magnetic-tape playback equipment with Sammy Rogers, head of the Houston-based geophysical firm. Mr. Rogers has two crews operating in the vast Sahara region of French West Africa. According to du Pasquier, one well —on a site pinpointed by geophysical work—turned up net oil pay of 320 ft. Seven wells have been completed.

Drilling has continued in Manifa No. 1 to a total depth of 9,637 ft. A, B, and C members of the Arab zone have been found productive. D member, highly productive member in Aramco's inland Abqaiq and Ghawar fields, has been unproductive at Manifa.

Sumatra Port Development

The first freighter to dock at the new Caltex Pacific Oil Co. cargo pier at Dumai on Rupat Strait in Central Sumatra recently established the community as an ocean terminal of growing importance in world trade.

The ship, the "Anne Bakke," sailed from San Francisco with 270 tons of 30-in. pipe ordered by the oil company for its 40-mile pipeline across the jungle between Dumai and the new Duri oil field in the interior. The freighter also delivered 190 tons of miscellaneous construction and building equipment to be used in developing the port of Dumai and completing the 40-mile Dumai-Duri road.

Under a $50 million expansion program, Caltex Pacific plans soon to pipe crude oil from its Duri and Bekasap areas directly here for export to the Philippines, India, Australia, Japan, and the Western Hemisphere.

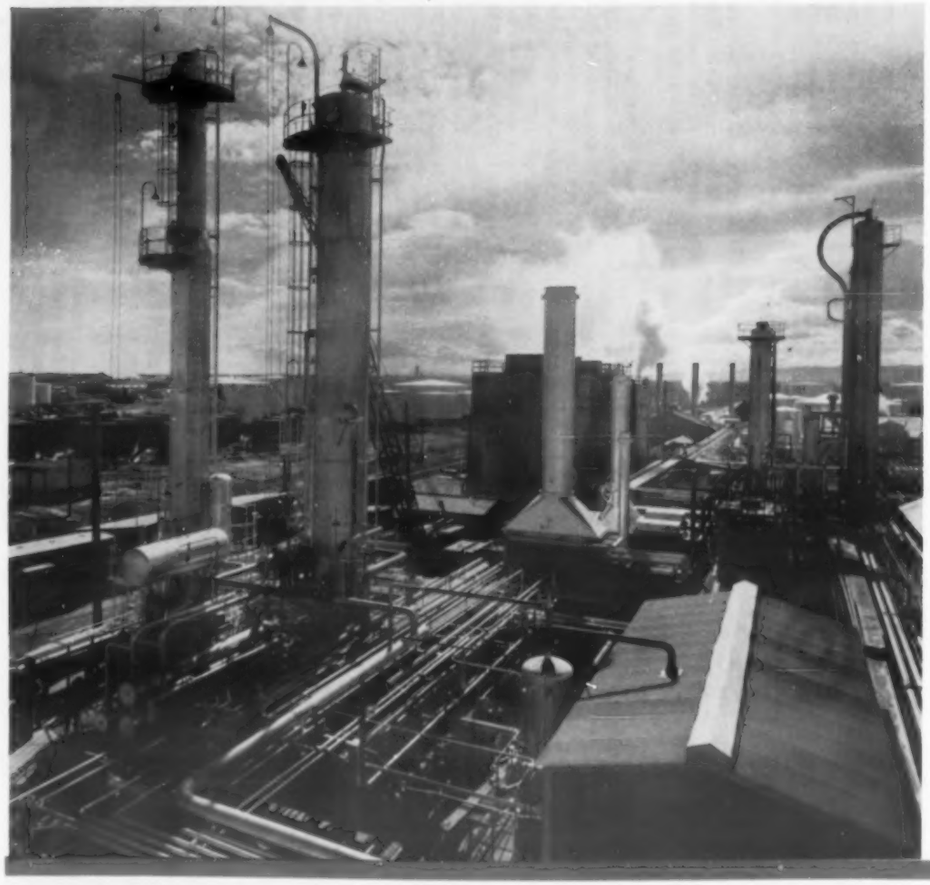
The programs call for extensive port facilities at Dumai, including a deep-water oil-loading pier for handling the world's largest ocean tankers. Caltex plans include a 140-house residential community five miles inland for employees—with club, hospital, administration building, school, and recreational facilities; a housing development nearer the port for tank farm, warehouses, and workshops.

It is expected Caltex Pacific's multi-million dollar expansion program will be completed late this year or early in 1959.

Part of a 290-ton shipment of 30-in. pipe from USA being unloaded at Caltex Pacific Oil Co.'s new cargo pier at Dumai on Rupat Strait in Central Sumatra.

DESIGNING IN 3-D

REDUCES INVESTMENT SPEEDS CONSTRUCTION



Cuts Engineering Time

Improves Designs

Minimizes Drawings

Facilitates Approval

Lowers Operating Costs

Speeds On-Stream Date

A recent example of a Kellogg technique that is sweeping the industry, this cat reformer typifies the time-and-money-saving aspects of designing with scale models. These include: conventional drawings of over-all layout and piping eliminated; man-hours spent on piping design cut in half; engineering and construction completed in a fraction of the normal time. Kelloggram No. 5, sent on request, describes techniques and economics.

MODEL UNITS NOW AVAILABLE

So that industry may benefit from the easily-assembled model units developed in conjunction with the technique, Kellogg is now making these plastic components available at low cost to industry and engineering schools. For information on how these components can be obtained, together with details on their use, write Kellogg's Contract Sales Division. Use coupon below.

Photograph above shows status of 3,800 BPD cat reformer at the Denver refinery of Bay Petroleum Company (subsidiary of Tennessee Gas Transmission Company) just prior to completion. Designed to use Sinclair-Baker regenerative catalyst RD-150, this unit promises optimum yields of high octane reformate, low catalyst cost per barrel, and minimum equipment corrosion and contamination.

Kellogg has engineered and built cat reformers designed for catalyst RD-150 in capacities from 875 BPD to 24,000 BPD. Just before completion of the Bay unit, a 2,500 BPD reformer was placed on stream in Europe. A representative would be glad to discuss investment and operating costs, yields, catalyst life, and other pertinent details of Kellogg-designed cat reformers with interested oil refiners.

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☐ Send ___ copies of 12pp Kelloggram No. 5, describing models and techniques.
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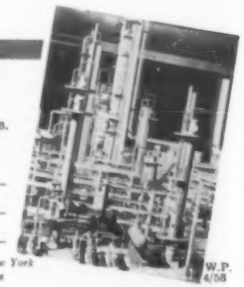

W.P. 4/58

Oil Company Staff Changes

HOWARD A. McKINLEY, Houston, has been promoted to the newly created position of manager of land in Continental Oil Co.'s foreign department. Formerly regional land superintendent in the company's CATC marine region, he will continue to make his headquarters in Houston. Mr. McKinley will coordinate Conoco's land activities in foreign countries. The company currently is exploring for oil in Egypt, Libya, British Somaliland, Somalia, Guatemala, and Venezuela.

RICHARD R. WILBER, has been appointed assistant manager of crude-oil supply for American Oil Co., a Standard Oil (Indiana) affiliate.

J. R. ASHLEY has been appointed general superintendent of the communications and electrical department of Magnolia Pipe Line Co. He succeeds D. H. Levy, who retired March 1.

JOHN D. MOODY has been appointed to the exploration staff, general-office production department, Gulf Oil Corp., Pittsburgh—where he joins Louis C. Sass and Dr. Wendell Gealy as exploration advisors to Dr. Hollis D. Hedberg, vice president for exploration.

Mr. Moody joined Gulf in 1938, and served with Kuwait Oil Co. from 1947-1949. Recently he was district manager at Midland, Texas. As exploration advisor, he will be concerned principally with exploration outside the USA.

H. BARKDALE BROWN, marine coordinator for Gulf Oil Corp.'s transportation department, has been appointed general coordinator of that department. Wessel C. Brodhead, formerly manager of costs and economic performance for Gulf in the New York marine department, succeeds Mr. Brown at Pittsburgh.

MALCOLM A. WEISS has been appointed head of production research section, newly created unit in process research division of Esso Research and Engineering Co., Linden, N. J.

FORD M. GRAHAM has been appointed vice president and senior representative for Monterey Oil Co. in Louisiana and Mississippi. He will direct exploration activities in the area from the company's offices in New Orleans.

CHARLES O. BARTLEY, associated with Mission Manufacturing Co. since 1942, has been elected vice president in charge of engineering and manufacturing, and as a director. Mission, headquartered in Houston, Texas, is world's largest manufacturer of oil-field fluid-end pump parts.

GENERAL ERNEST O. THOMPSON, member of the Texas Railroad Commission, has been named chairman of the legal committee of the Interstate Oil Compact Commission.

HARRY J. KENNEDY, Continental Oil Co., has been appointed a senior vice president. Mr. Kennedy, in addition to directing operations of the marketing department, will have reporting to him the industrial and public-relations departments.

GORDON RITTENHOUSE of Shell Development Co., Houston Texas, has been elected 1958 president of the Society of Economic Paleontologists and Mineralogists.

JAMES D. BUSHNELL has been appointed head of the fuels and treating section, planning engineering division of Esso Research & Engineering Co., and Daniel Hartley has been named head of the mechanical engineering development section, design engineering division, of this SONJ affiliate.

OLAF P. JENKINS, state mineralogist and chief of California State Division of Mines for 11 years, has retired to enter private practice as an economic geologist for Carroll E. Bradberry and Associates of Altos.

EDGAR KRAUS has been appointed assistant general manager of the domestic crude-oil production department of The Atlantic Refining Co., Philadelphia. He has served as manager of the domestic producing exploration division since 1952.

Dr. Kraus will succeed James N. Mendenhall as general manager upon the latter's early retirement. William B. Moore, formerly manager of the company's South Louisiana production region, will succeed Dr. Kraus as manager of the exploration division. Louis F. Davis has been appointed to the new position of regional division manager, heading up the company's six producing regional divisons. He was formerly manager of the Oklahoma-Kansas region.

C. KENNETH EILERTS, physical chemist and petroleum engineer of the Petroleum Experiment Station of the Bureau of Mines, Bartlesville, Okla., has received the distinguished service award and gold medal of the Department of the Interior.

ORVAL MOORE DIES

Orval F. Moore, 68, retired director and vice president of The Ohio Co., died February 24 in Rankin, Texas. In a career covering nearly 45 years with Ohio Oil, Mr. Moore advanced from stenographer to become manager of the company's extensive activities in the supply and transportation of crude oil and refined products, as well as a director and vice president. He retired on September 1, 1954.

E. R. Jones

F. W. McCurry

W. G. TIERNEY, president of Derby Refining Co., recently announced E. R. Jones has resumed supervision of manufacturing of the Derby Refining Co., Wichita, Kans. He succeeds Frank W. McCurry, retired. Mr. Jones joined Derby in 1939 in the refinery operating department.

Mr. McCurry will continue to serve as a director and act as a consultant on refinery problems. He joined Derby in 1923 as a chief chemist, and has been vice president in charge of manufacturing since 1931.

HENRY FLYNN, general superintendent of The Texas Co.'s refinery at Port Arthur, Texas, has been named manager. He succeeds F. L. Wallace, retired.

E. W. McNealy, assistant general superintendent since June 1957, succeeded Mr. Flynn as general superintendent.

P. C. SPENCER, president of Sinclair Oil Corp., has been elected treasurer of the American Petroleum Institute—succeeding B. Brewster Jennings, retired. Mr. Spencer previously served two one-year terms as chairman of the API board.

H. EDWARD WOLF, Colorado oil man and financier, was named president of Erie Natural Gas Co., which owns gas and oil-producing properties in Texas, New Mexico, and Pennsylvania.

ERNEST J. MALOVICH has been placed in charge of seismic-field parties operating in India for Geophysical Service Inc. He will maintain headquarters in Calcutta, India. He was serving as a seismic party chief in Pennsylvania at the time of his promotion. He will be succeeded in Pennsylvania by Al Harris, who joined GSI in 1941 and has been serving as a party chief in Mexico since 1952.

HARRY HANNA has been appointed chief engineer in the producing department of Kerr-McGee Industries Inc. He was transferred to Oklahoma City from Morgan City, La.

HENRY B. WILSON, JR., has been elected president of Esso Standard Espanola SA, marketing affiliate of Standard Oil Co. (New Jersey), in Spain. Formerly vice president of Esso Standard of Brazil, Mr. Wilson succeeds Guy S. Warner, who is retiring.

A native of Washington, D. C., Mr. Wilson joined Jersey Standard's affiliate, Humble Oil & Refining, in 1928. From 1936 until 1941, he was employee-relations manager for Jersey affiliates in Argentina and Venezuela. In September 1951, he was elected a director of International Petroleum Co., Ltd., Jersey affiliate operating in Latin America, where he remained until his election as vice president and director of Esso Standard of Brazil in 1954.

WILLIAM T. REED, son of Representative Dan Reed (R., N.Y., top Republican on the House Ways and Means Committee), has been named Washington representative of Standard Oil Co. (Ind.). Young Reed has been in staff jobs at the capitol for 10 years. He succeeds Ira P. Bradford, resigned.

S. D. BECHTEL of San Francisco, president of the Bechtel Corp., has been elected chairman of the Business Advisory Council of the Department of Commerce, it has been announced by Secretary of Commerce Sinclair F. Weeks. He succeeds Eugene Holman of Standard Oil Co. (N.J.). Among seven new members of the council are Augustus C. Long, chairman of The Texas Co.; and Herbert Hoover, Jr., consulting engineer, Los Angeles, Calif.

L. W. MacNAUGHTON has been elected to the board of Dresser Industries Inc. Board chairman for the consulting firm of DeGolyer and MacNaughton, Mr. MacNaughton, brings to Dresser three decades of experience in the oil industry, is a co-founder of the geological and petroleum consulting firm, and has contributed to advances in several fields of the petroleum industry. Born in Cuba of American parents, he was educated in New York. After graduating from Cornell University in 1925, he was successively employed as gologist by Humble Oil, Rycade Oil, and Amerada Petroleum.

FRANK W. PIERSOL has been appointed manager of Standard Oil Co. of California's Department on Organization—succeeding Lewis L. Purkey, who retired after 47 years' service.

MORTON A. STERLING has been named president of Sunset International Petroleum Corp., San Francisco. J. D. Sterling, Sunset president for many years, has been named to fill the recently created position of board chairman.

G. J. KOHLER, Jr., has been appointed vice president of Geophysical Service Inc., in Latin America; and Ray H. Wright has been named vice president of Geophysical Service International Corp., for Canada.

Mr. Kohler has been assigned to GSI's headquarters in Dallas, Texas, and Mr. Wright will direct the firm's Canadian operations from Calgary, Alberta.

B. DeWITT MITCHELL, of New York, has become executive vice president of Yucca Mining & Petroleum Co. Inc., Albuquerque, New Mex. He is geologist and petroleum production engineer.

RAYMOND F. HADLEY, chief engineer of product lines department of Sun Pipe Line Co., Philadelphia, has been appointed to the additional post of vice president.

GEORGE T. HANSEN, founder of Utah Southern Oil Co., will retire as chairman and as a director following the annual meetings April 21. Mr. Hansen served as president of the firm from its beginning in 1921 until his election as chairman of the board in August 1957. At that time, he was succeeded as president by John E. Rouse, who continues to serve in this position.

WILLIAM M. SCHMITT, assistant general manager of the motor products department, has been appointed general manager of advertising of Sun Oil Co. At the same time William B. Daub was appointed advertising manager for industrial products and Palmer McKay advertising manager for motor products. Both had previously been assistant advertising managers in charge of their respective divisions.

ROY C. WILLIAMSON, assistant manager of the Fort Worth, Texas, division for Sinclair Oil & Gas Co., has been named Fort Worth division manager. He succeeds P. C. Brooke, vice president and division manager, who will retire this year.

M. H. Lowrance, exploration superintendent of the Fort Worth division, becomes assistant division manager.

WILLIAM A. WILLIAMS has been appointed refining coordinator for Standard-Vacuum Oil Co., White Plains, N. Y.—succeeding Alfred B. Vought, who retired as of January 31.

Mr. Williams joined Stanvac in 1952, after 18 years' experience in Canada, and served three years as chairman and managing director of its refining subsidiary in India during construction and initial operations of the company's Bombay refinery. He entered the industry in 1934 as a laboratory technician at Imperial Oil Ltd.'s refinery at Sarnia, Ontario, advancing to the post of assistant superintendent of process operations. Between 1950-52, Mr. Williams was superintendent of Imperials' Montreal refinery.

LEWIS L. PURKEY has retired after 47 years' service with Standard Oil Co. of California. He formed Standard's Department on Organization in 1931, and has directed the company's organization planning work since that time.

EDWARD H. LEE, special representative in the office of the executive vice president of The Ohio Oil Co., retired February 1, after 25 years' service with the company.

GEORGE S. BUCHANAN, director, Husky Oil Co., Cody, Wyo., will become the 42nd president of American Assn. of Petroleum Geologists.

FRANK H. STONE, manager of natural gas and gasoline department of La Gloria Oil and Gas Co., has been named a vice president of the company. La Gloria is a wholly-owned subsidiary of Texas Eastern Transmission Corp., Shreveport, La.

EVERETTE E. KERNS has been appointed to the newly created post of engineering consultant on safety administration in the manufacturing department of The Standard Oil Co. (Ohio), Cleveland.

ROBERT E. PULVER has been appointed manager of the new $33.5 million Bataan refinery project, in the Philippines, of Standard Vacum Oil Co. He also has been elected a director of the newly formed subsidiary, Standard-Vacuum Refining Corp. (Philippines), which will operate the plant. He began his duties at Manila, January 20, taking charge of pre-construction activities.

Since joining Standard-Vacuum in August 1955 as a supervising engineer in the refining coordination division, Mr. Pulver has been closely associated with the Bataan refinery project and, in general, with the development of plans for other new refineries and refinery components.

PERRY E. BARNHART of Midland, Texas, has been appointed district geologist for Cities Service Oil Co., at Lafayette, La., district; and Bill James, of Midland, has been named to succeed Mr. Barnhart as district geologist at Midland.

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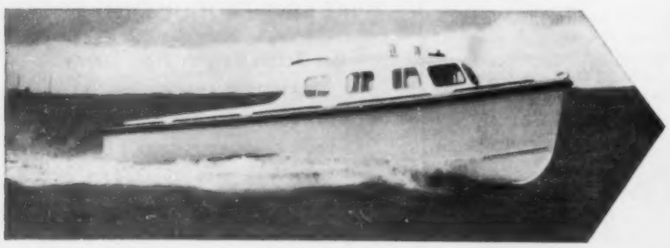

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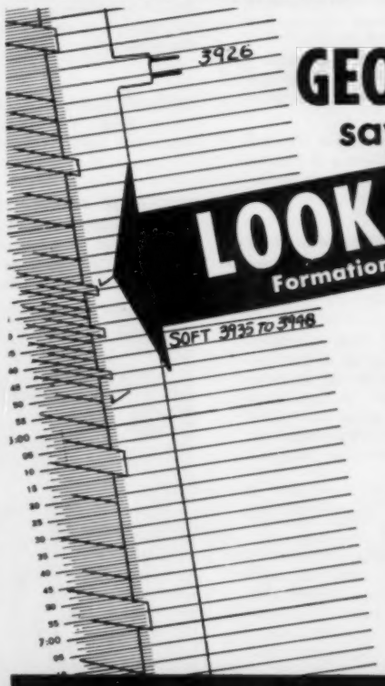

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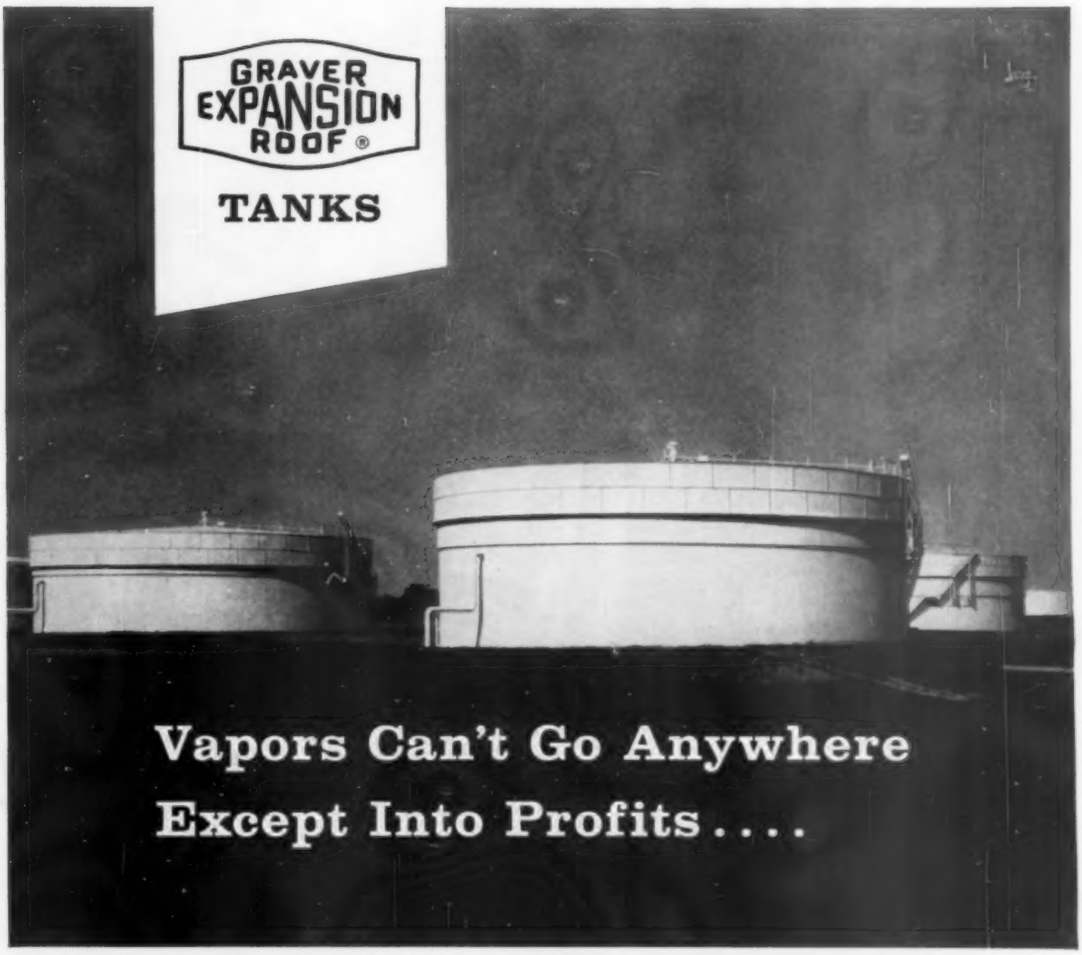

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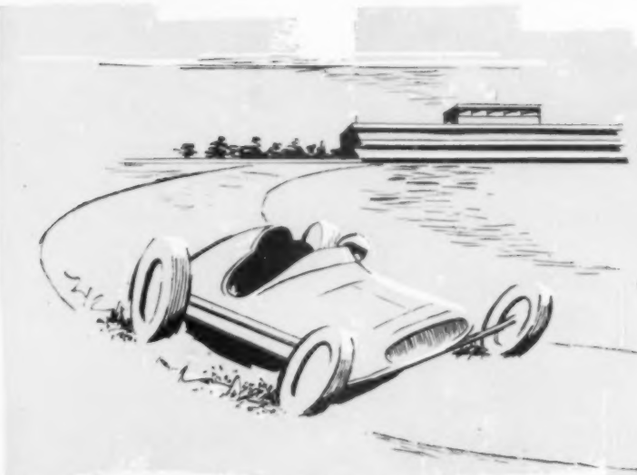

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Meet Another
✳RECORD BREAKER

Security's S3-J bit wins increasing favor among Texas Gulf Coast drilling contractors. Charles Richmond (right) tool pusher for Harry T. Bryant Drilling Company of Houston, Texas, comments: "I use more than 50% Security on my rig. Your rigside service started me buying. Performance keeps me a majority Security user." Here, Richmond takes delivery of more S3-J's from Security's Don Wilson, on call 24 hours a day. Another reason Security is *now 2nd in sales!*

Wherever you drill, experience that plus + bit of Security, product of vanguard engineering . . . sterling quality . . . world-wide uniformity . . . matchless rigside service!

Security

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DOWELL has the fracturing service to help you unlock your formation

WHAT'S your formation?
Limestone, chert, dolomite, sand?
Each one's different and there are many variations within each general formation.

That's why Dowell has developed eight basic fracturing services—each for a specific purpose in stimulating well production. Also, numerous chemical additives have broadened the range of these *basic* treatments to make them even more effective in widely-varying formations.

But Dowell is not stopping here. Still better materials, techniques and equipment are being developed by Dowell's field and laboratory research groups. The Dowell organization—chemists, engineers, field personnel—is a team you can count on to help you unlock *your* formation. Dowell Incorporated, Tulsa 1, Oklahoma.

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Services for the oil industry

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